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THE

DIAGNOSIS AND TREATMENT

OF

DISEASES OF THE CHEST.

A TREATISE

ON THE

DIAGNOSIS AND TREATMENT

OF

DISEASES OF THE CHEST.

PART I.

DISEASES OF THE LUNG AND WINDPIPE.

BY

WILLIAM STOKES, M. D., M. R. I. A.,

CORRESPONDING MEMBER OF THE MEDICO-CHIRURGICAL SOCIETIES OF BERLIN
AND LEIPZIG, HONORARY MEMBER OF THE HUNTERIAN SOCIETY OF
EDINBURGH, PHYSICIAN TO THE MEATH HOSPITAL AND
COUNTY OF DUBLIN INFIRMARY, ETC.

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TO

WHITLEY STOKES, M.D.

LATE SENIOR FELLOW,

AND NOW REGIUS PROFESSOR OF MEDICINE,

AND LECTURER ON NATURAL HISTORY,

IN THE UNIVERSITY OF DUBLIN,

THIS VOLUME

IS DEDICATED

BY A GRATEFUL AND ADMIRING

SON.

ROBERT J. GRAVES, M.D. M.R.I.A.

KING'S PROFESSOR OF THE INSTITUTES OF MEDICINE,

ETC. ETC.

MY DEAR GRAVES,

Permit me here to inscribe your name with that of my father. To him we owe, in a great measure, the founding of clinical instruction in Dublin; and to you, the signal advancement of it by the introduction of the practical method. Accept this book in testimony of the kindly intercourse that for many years has passed between us, and as a mark of gratitude for benefits which can never be forgotten nor repaid.

WILLIAM STOKES.

PREFACE.

It is now more than two years since this work was commenced, and more than a year since the three first sections were printed. This delay was unavoidable, and proceeded from causes which need not be specified here; and I mention it in order to explain many imperfections, and seemingly wilful omissions.

In the composition of the work, I have kept two great objects steadily in view. Of these, the first is the close connexion of the study of physical signs with that of symptoms, so as to illustrate their mutual bearing on diagnosis, and remove that unjust opprobrium thrown on the advocates of auscultation, that they neglect the study of symptoms. In the next place, I have endeavoured to simplify the subject as much as possible. A sufficient experience has convinced me, that any man of ordinary education may acquire the power of distinguishing thoracic diseases in a degree sufficient for all practical purposes, without troubling himself with those excessive refinements in the diagnosis from acoustic signs, on which some have improperly prided themselves. I have endeavoured to adapt this work to the wants of the practical man, always assuming that he is familiar with the groundworks of the subject, with the characters and causes of physical signs, as originally taught by Laennec, and more recently investigated in the works of Forbes, Williams, and Clark. Hence, I have not entered at any length into the characters of physical signs, but rather into the art of reasoning justly upon them; for it is in this that most observers fail. It cannot be too often repeated, that physical signs only reveal mechanical conditions, which may proceed from the most different causes; and that the latter are to be determined by a process of reasoning on their connexion and succession, on their relation to time, *and their association with symptoms:* it is in this that the medical mind is seen. Without this power, I have no hesitation in saying, that it would be safer to wholly neglect the physical signs, and to trust in practice to symptoms alone.

When thus considered, every addition to our knowledge of physical signs must be gladly received. I trust I may, without vanity, allude to the subjects of dilatation of the air cells; the early stages of pneumonia, and phthisis; cancer of the lung; pericarditis; and the signs of the accumulative diseases,—in evidence, that I have felt the value of physical diagnosis, and that in this still wide and open field, the labours of many years have not been unrewarded.

I have only spoken of pathological anatomy so far as was necessary to illustrate diagnosis; for on this latter subject there is now such a mass of facts, that were I to have attempted full pathological descriptions, the work would have been swelled far beyond a convenient size.

The purely hæmorrhagic and spasmodic diseases of the lung are not described in this work. I could add nothing to what is already known with respect to pulmonary apoplexy, asthma, and hooping cough, and have determined, for the present, to omit their consideration. These are diseases which still require much original investigation.

In discussing treatment, I have endeavoured more to point out principles, than enter at any length into the details of practice. It would be impossible to anticipate all the combinations of symptoms which may arise. If we can get a general principle, we must trust to our tact and experience, to modify its application according to circumstances. As far as was possible, I have shewn the utility of physical signs in practice ; for it is in the curable diseases that their great value is seen. Indeed, in a large proportion of such cases, the first effect of treatment is to render disease latent, and to cause an absolute necessity for the study of physical signs.

I have not entered into any description of the different modifications of the stethoscope which have been from time to time proposed. All that is necessary for a good instrument, is that it shall consist of but one piece, be constructed of cedar or some light wood, have its bell small, and with rounded edges, and the ear-piece sufficiently concave. On the subject of mediate percussion, I can only say, that the finger, with its back turned to the chest, seems the best pleximeter ; and that I have not found the instrument of M. Piorry, or his mode of investigation, to possess the advantages which he has described. I am far, however, from undervaluing M. Piorry's labours in the field of diagnosis.

Finally, in availing myself of the labours of others, I have always endeavoured to acknowledge the sources of my information. If in any instance this has not been done, the authors may rest assured that the omission was unintentional, and that I shall thankfully receive the notification of the error, and take the first opportunity of correcting it.

W. S.

DUBLIN, *April* 4, 1837.

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THE
DIAGNOSIS AND TREATMENT
OF
DISEASES OF THE CHEST.

SECTION I.

GENERAL PRINCIPLES OF THE DIAGNOSIS OF THORACIC DISEASE.

It cannot be doubted, that the labours of modern pathologists in the localization of disease, overrated though they, perhaps, have been by the disciples of certain schools of medicine, have yet done much to remove that great reproach of the art—its uncertainty. The discoveries of the different and numerous seats of morbid action, led, directly, to the study of the symptoms of these lesions, and of those physical phenomena, which resulted from, or accompanied them; and thus has the science of diagnosis been placed on a sure basis, that time with its mutations of opinion can never shake.

In the recognition of the seat and nature of disease, it is obvious that a great number of circumstances must be taken into consideration besides the actual signs and symptoms of the affection. Age, sex, habit, exciting cause, and duration of symptoms, all form links in the chain of evidence on which we ground our opinion: but, it would appear, that it is in the study of what are termed the signs and symptoms of disease that we have made the greatest advances in modern times.

By morbid signs we mean phenomena, recognizable to the senses, but particularly to those of sight, touch, and hearing, which are evidences of physical alterations in the conditions and relations of parts. These alterations may be enumerated, as changes in colour, shape, and volume, changes in resistance, peculiarities of feel, and lastly, the production of particular sounds under certain circumstances, perceptible either with or without the assistance of mediate auscultation, and either wholly new or characteristically altered. To the diagnosis founded on the observation of these phenomena we give the name of physical diagnosis, inasmuch as by it, that is to say, by the observation of physical signs, we recognize certain physical alterations of parts, which may be studied without reference to those functional lesions which have preceded, accompany, or follow them. Thus, the feeling of fluctuation reveals the existence of a fluid, but tells us nothing of its cause. The sound of fluctuation shows the co-existence of fluid and air, which may arise from different diseases. The signs of gurgling and cavernous respiration in the lung point out a cavity communicating with the bronchial tubes and containinig some fluid, but the cavities which produce these phenomena may be of various kinds—gangrenous, phthisical, pneumonic, &c. Dulness of sound of the chest points out an obliteration or displacement of the air cells, and the substitution of a solid or liquid for air, a condition which may arise from various causes. The sensation of friction only points out a roughened condition of serous membranes, but reveals nothing as to its cause. The deviations of shape and volume of the great cavities indicate some anormal state, but when we seek for their causes we must have reference to other sources of information. These illustrations of physical signs might be extended, but enough has been said to explain the true signification of the term.

We may consider symptoms as different from signs in this, that while the signs belonging to sight, touch, and hearing are founded on physical conditions of the organs themselves, symptoms result from changes in the functions of the suffering organs, and in the modifications produced by disease in their vital relations with other parts. And hence we consider symptoms in a threefold manner:

1st. Changes in the functions of the part itself.

2nd. Changes in the phenomena of organic life in various parts of the system.

3rd. Changes in the phenomena of animal life.

Thus, in examining the symptoms of a disease of a particular organ, we investigate the state of its own functions. We then examine the changes caused by disease in all the phenomena of organic life, such as digestion, respiration, circulation, absorption, nutrition, exhalation, secretion, and animal heat. From these we advance to the phenomena of the life of relation, and examine the changes produced in the muscular power or function, the organs of sense, the moral affections, and intellectual manifestations.

In a case of acute inflammation of the lung, we observe, in the first place, lesions of its own function, painful and hurried respiration, imperfect arterialization of blood, cough, and expectoration; these are what may be called local symptoms, but we may have others referrible to the disturbance of organic life in parts distinct from the lung; thus we observe excitement of the heart, fever, and various derangements of the digestive and urinary systems: further, in certain cases there may be signs of a lesion of the phenomena of the life of relation, as for instance, prostration of strength, and other signs of derangement of the cerebro-spinal system.

It must be obvious, that in the detection of the nature and seat of any disease, the more we can combine the observation of physical signs with functional symptoms the greater will be the accuracy of our diagnosis. Now, if we compare together the diseases of the three great splanchnic cavities, we find that those in which this desirable combination is most attainable are, first, those of the chest; next, the abdomen; and lastly, the affections of the brain and spinal marrow. Accordingly, if we compare the diseases of these systems with respect to the perfection of diagnosis, we find the order to be, first, the respiratory; next, the abdominal; and last, the cerebro-spinal, or that in which this combination is least applicable.

As the principal object of this work is to elucidate the diagnosis of the diseases of the thoracic viscera, we shall enter on this subject by remarking, that the contents of the chest in the healthy and diseased state are most favourably circumstanced for the multiplication and distinctness of physical signs. And it is obvious, that the great improvement by which the present time is distinguished in the diagnosis, and consequently the treatment, of thoracic disease, is traceable to this circumstance.

In confirmation of the former proposition, let us consider,

First.—That of the different cavities of the body, the chest is that in which the existence of air in quantity is a natural condition. It is wanting in the cranium, and when occurring in the abdominal cavity may be generally considered as a morbid production or an excretion. But the chest is the receptacle of air for the body. Now it is easy to show, that other things being equal, the sound on percussion is directly as the quantity of air within the chest; and the applicability of this to diagnosis is at once seen, when we consider that the effect of every organic change of the lung is to diminish or to increase the whole quantity of air within the thorax, and, of course, to cause a corresponding increase or diminution of the natural sound.

Secondly.—We must recollect the remarkable separation of the viscera on either side of the chest. In fact, of all the organs, which in the life of the embryo, and by the law of excentric development, are formed primitively double on the mesian line, there is none that preserves its duplicity more completely than the lung. The brain, it is true, is separated into hemispheres, and the liver into a right and left lobe; but the union of opposite portions of either organ is much more complete than what is found to exist in the lung, and the latter also, with the exception of the testicle, is the only organ of the body whose original symmetrical halves are covered by separate serous membranes. The importance of all this to physical diagnosis is immense, for it is on this circumstance of separation that its true principle, *comparison,* mainly depends.

If this great separation of the lungs did not exist—if in place of their being merely connected by their vessels and air tubes at the root, they were fused by continuity of their parenchyma, and covered by the one serous membrane, as the liver or brain, then the diagnosis of the exact seat of disease, which we will see is of the greatest practical importance, could not be attained: and it would be indeed difficult to discover an empyema, a partial pneumonia, or an incipient phthisis. Further, the division of the lung into lobes, although these portions be not wholly separated, is yet advantageous in the same point of view, as these divisions act more or less in circumscribing diseased action, and of course increase the applicability of the principle of comparison.

Thirdly.—The thoracic viscera differ widely from those of the cranium or abdomen in the constant, uniform, and extensive motions which their functions require. These, whether of the lungs or heart, whether active or automatic, are perceptible by physical signs, and thus we have a standard by which many departures from the healthy condition may be easily estimated. It may be said indeed, that this circumstance of motion is not peculiar to the lung or heart. But while we admit the existence of the motions of the brain, we must remember that they are slight, and in the adult totally concealed by the bony cranium, while those originating in the viscera of the abdomen are irregular and often imperceptible. Now, on the existence of these motions depends much of the physical diagnosis. If we look to the lungs merely, we find that the act of respiration causes phenomena appreciable by the ear, eye, and touch. The murmur produced during inspiration and expiration, and the alternate contractions and expansions of the chest, evident both to sight and feeling, all furnish most important physical signs in cases of disease. Thus, in Laennec's emphysema, when the disease has been carried to a high degree, we find that on account of the great volume of the lung the murmur produced is feeble, and the expansion and contraction of the chest trifling, as compared with the effort of the respiratory muscles. These circumstances may often suffice for the recognition of the disease. Again, in certain cases of empyema, we can easily recognize the absence of motion on one side and the corresponding increase of expansion on the other. Many more examples might be given.

Further, the regular motions of the heart, productive as they are of peculiar impulses and sounds, are not only directly available for the detection of cardiac and aortic diseases, but also for those of the lung, as will be abundantly shown in the progress of this work.

Fourthly.—The thoracic cavity is the only one in the diseases of which the phenomena of the voice can be made available for diagnosis. It is true, that of the various physical signs these are perhaps of the lowest value and most liable to mislead, but when combined with other circumstances, they become of important assistance in the detection of pulmonary disease. There is one case of disease of the circulating system in which we may avail ourselves of the signs drawn from this source.*

Fifthly.—Great assistance is derived in the detection of pulmonary and cardiac disease, from the peculiar modifications of shape which the chest undergoes from a number of causes. If we look to the affections of the head and spinal cavity, we find, that with the exception of some few cases of congenital dropsy, arrest of development, or chronic effusion, the more frequent diseases of this class do not produce any perceptible alteration or change of shape in the bony cases of the cerebro-spinal mass. In the abdomen, on the other hand, from the very yielding nature of its parietes, changes of volume and shape are common ; but it will be found, that these seldom are available for the detection of the nature of their cause, a circumstance as well attributable to the great yielding of the parietes, as to the fact of the viscera being contained in a single cavity. The chest, however, presents bony, elastic, and fleshy parietes, and its principal viscera occupy *three distinct cavities.*

---

* See Aneurism of the Aorta.

Although it cannot be maintained, that the alterations of shape and volume of the chest will always suffice to point out the nature of their causes, yet we must admit, that with respect to the diseases of its interior, the modifications of its exterior are more numerous and of greater diagnostic value in the chest than in either of the other two cavities. Let us consider the extraordinary convexity of the whole chest, the arching of the sternum, and the appearance of the shoulders in a case of dilatation of the air cells ; the loss of symmetry in the sides, and the peculiar smooth appearance produced by the pressure of the fluid on the intercostal spaces, in the case of empyema ; the contraction of the side and the depression of the shoulder while the spine remains unbent, in the same case, where absorption of the fluid has taken place ; and the sunken and flattened appearance of the antero-superior regions in advanced phthisis. All these are instances of peculiar modifications of shape of the exterior walls of the cavity, coinciding with physical changes in the subjacent viscera. It is true, that taken alone they could not lead to a positive diagnosis, but when combined with other signs and symptoms their value is highly important, and this, with their number, should make us admit, that as a means of diagnosis, the modifications of external form produced by disease are more valuable and much more frequently applicable in thoracic than in the cerebro-spinal or abdominal affections.

Sixthly.—The thoracic viscera, at least as far as the lungs are concerned, differ most remarkably from the cranial and the abdominal, in the facilities furnished by their structure and function, for the detection of disease, by the direct recognition of the products of that disease. The conditions on which these facilities are found to depend are various, but the principal are separation, mobility, elasticity, and their direct and universal permeability to air by means of the bronchial ramifications. Of these the last is the most important.

Thus, if we look to the brain with respect to the discovery of effusion in a case of arachnitis, we find that there is no direct physical sign of such a lesion, and its presence can only be guessed at by the existence of certain symptoms, which modern researches have shown to be extremely fallacious.* We have no physical means of ascertaining its presence or absence. But how different is the case with the lung, in which, by the assistance of percussion, by the observation of changes of position, by the characters of respiration and of the voice, and by the observation of the displacements of the lung itself, the heart, and the abdominal viscera, the detection of a fluid in the serous cavity becomes as easy as it is certain. Again, let us compare the facility of diagnosis of an abscess of the cerebral with that of the pulmonary substance; here also, the existence of the first lesion can only be determined by the study of functional alterations; there is no physical sign, and we must farther admit, that even after the researches of a Lallemand, a Serres, a Foville, or an Abercrombie, that he who would make the positive diagnosis of such a lesion, must have a confidence not justified by the present state of the science.

But if in a case of pneumonia, after the recognition of the ordinary symptoms and signs of the disease, we discover the phenomena of cavernous respiration, gurgling, and pectoriloquism in the affected portion of the lung, we know that there must be a cavity of some kind, and of its nature our previous observations leave scarcely a doubt. Here, the facility of diagnosis would not exist, if, like the brain, the lung had been a closed organ; but its permeability to air, and the regular and forcible entrance and expulsion of this fluid into and from its cavities, are the conditions which, by enabling us to discover new secretions, and organic changes, easily reveal the lesion.

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* See Andral, Clinique Medicale. Maladies de l'Encephale.

The same train of reasoning applies to the diseases of the parenchymatous organs of the abdomen: the liver, spleen, kidneys, pancreas, and mesenteric glands. Here, for the same reasons, neither auscultation nor percussion can apply, unless in a case of mere enlargement, when the latter mode of investigation can be sometimes employed. Abscess of any of these organs cannot be accompanied by signs similar to those of abscess of the lung, nor are there any physical means which assist in detecting the earlier stages of inflammation. Nothing is so easy as to detect the suppuration of pulmonary tubercles; but in the case of the abdominal organs, even supposing that tubercles were recognized, who could pronounce upon their actual state?

Further, in comparing the diseases of the gastro-intestinal with those of the pulmonary mucous membrane, with respect to the facility of diagnosis, we are at once struck with the difference in favour of the latter. There is no physical sign proper to a gastro-enteritis, and its detection must depend altogether upon vital phenomena; but in the case of bronchitis we have, in addition to the functional lesion, a group of signs resulting from the physical changes of the part, which often enable us to detect the slightest shade of mucous irritation, and to pronounce on the exact locality, extent, and stage of the disease.

Lastly.—If we consider the chest as to the mechanical nature of its walls, and the mobility of its contained viscera, we see, that in its diseases, a fruitful source of physical signs is contained in the various and remarkable displacements, not only of these viscera, but of those contained in the cavity of the abdomen, a source of diagnosis not applicable to the diseases of the brain, and scarcely to those of the digestive system.

Thus, a moderate effusion into the pleura will displace the lung from below upwards, acting but little on the side, on account of its greater resistance. When more extensive it presses the lung against the mediastinum, and in consequence of this septum yielding more than the bony wall, it is pushed beyond the mesian line, of course carrying with it the heart either to the right or left side, as the case may be. Now all these displacements of the lung, mediastinum, and heart, are easily appreciable by physical signs.

But we observe displacements of the abdominal viscera consequent on thoracic disease, a circumstance explicable by considering the nature of the floor of the thorax; that it is not, as the rest of its parietes, bony or cartilaginous, but formed principally by muscle and some tendinous expansion. Under circumstances of great accumulation of fluid, or of hypertrophy of the lung, this muscular wall yields to pressure, its convex surface becomes flattened or even concave, the viscera of the abdomen, on the side corresponding to the affected lung, are pushed down before it, and from their displacement a new and most important source of diagnosis is obtained. It is true that the reverse may happen, and the thoracic viscera shall be displaced by abdominal disease; thus, an enlarged liver or spleen, an abdominal aneurism, or an accumulation of air or fluid in the belly, by pressing on the concave side of the diaphragm, may displace the lung or heart, but it is obvious, that when we consider the difference between the abdominal and thoracic walls, and the yielding nature of the latter, such can only occur in very extensive disease. It is plain, too, that the natural action of the diaphragm will tend to diminish these effects, while in the former case it could have no such influence; and it will be proved in the following pages, that an amount of pressure on the concave side of the diaphragm, carried even so far as to displace the superjacent viscera, does not deprive it of its contractile power.

If we take a general view of the cranial, thoracic, and abdominal cavities, it would appear that in none of them is the diagnosis of disease, from symptoms alone, so difficult as in the chest. But further investigation will prove to us, that there is no cavity in the diseases of which, when we combine the study of symptoms, properly so called, with that of physical signs, the determination of the nature, extent, and modifications of disease is so easy and certain. In fact, the diagnosis of thoracic diseases is founded on the combination of signs and symptoms, and we shall find, that of all the cavities the chest is that in which the physical signs are most numerous and of most extensive application.

The nature of thoracic disease may be occasionally determined by the consideration of signs or the observation of symptoms; but it is obvious that the more we combine the two the more exact will our diagnosis be. In diseases of the thoracic viscera there is a greater necessity for mechanical diagnosis than in those of the brain or abdomen, for the general resemblance of the symptoms of the different thoracic diseases is much more striking than that of the cranial or abdominal affections.

In the case of the brain we can often distinguish between arachnitis and deep-seated local inflammation. In that of the abdomen it is not difficult to distinguish between a mucous and a serous inflammation, nay, we are even able to distinguish between the disease of the different portions of the mucous expansion, as between gastritis, duodenitis, ileitis, and inflammation of the large intestine. But in the case of the thorax, this accuracy from symptoms alone is too often inaccessible. Pain, dyspnœa, acceleration of breathing, cough, and expectoration, are the prominent characteristics of a great number of essentially different diseases.

It has been asserted, that by studying the varieties in the nature, mode of occurrence, succession, and modification of these symptoms, we can, independently of the information derivable from physical signs, arrive at an accurate diagnosis of thoracic disease. This is the *common* assertion of those few who are still opposed to the use of mechanical diagnosis. It is not to be denied, that in many instances the physician without the aid of the stethoscope or percussion may arrive at a sufficiently accurate diagnosis, and, that before these modes of ascertaining chest disease were introduced, the nature of many cases was correctly determined; but I feel no hesitation in saying, that for the attainment of such accuracy, the combination of careful observation, uncommon tact, and long experience, is absolutely necessary. In other words, that there must be qualifications which it is next to impossible any young practitioner can possess. And, after all, however painfully and slowly this power of diagnosis has been acquired, it is still imperfect, an assertion well borne out by the comparison of the state of our knowledge previous and subsequent to the discoveries of Laennec. The prominent symptoms of chest affections which have been enumerated, may occur in the same order and the same manner in many essentially different diseases; in bronchitis, pneumonia, tuberculization of the lung, and pleuritis. Every one who has studied chest affections must have seen examples of all these cases, accompanied by symptoms exhibiting a resemblance which would puzzle the most profound and accurate symptomatologist. Now, supposing that the character and succession of the symptoms were the same, and the diseases of equal frequency, and that we were to fix upon any one disease as the cause of these symptoms, there would be three chances to one against our coming to an accurate conclusion.

I am quite aware that many persons will object to this, and maintain, that although these symptoms occur in the above mentioned diseases, and even in the same order, yet that their nature is different. In the characters of expectoration, for instance, sufficient data for ascertaining the nature of its cause may exist; thus, in advanced phthisis it is purulent; in bronchitis, mucous; in pneumonia, bloody, and so on. All this, though true to a certain degree, is yet, when generally applied, far behind the actual state of medicine, which has proved, that we may have in each of these principal diseases every variety of expectoration, or no expectoration at all; and we may extend the same kind of observation to the cough, dyspnœa, acceleration of breathing, and pain.

It may be said, that besides those mentioned there are other symptoms capable of assisting in diagnosis; as, for instance, the mode of decubitus, or the occurrence or non-occurrence of hectic. But both of these are equally fallacious. A patient with the most enormous empyema shall lie on the healthy side, and hectic is often absent, though the lung be full of suppurating cavities, or well marked without a tubercle in the lung. And, with respect to the occurrence of fever in general, it is notorious that every disease of the lung may be apyrexial, or occur with all varieties of fever.

Lastly, the advocates of physical examination may well appeal to the frequency of the latent affections of the lung, as showing the necessity of this mode of investigation. The lung may be hepatized without cough, dyspnœa, acceleration of breathing, pain, expectoration, or fever. But this change cannot occur without the existence of physical signs sufficient for its detection, and nearly the same remark is applicable to many other instances of pulmonary lesion.

It is plain, that the study of symptoms alone cannot lead to accurate distinction of chest disease, the same remark is applicable to that of physical signs unconnected with symptoms. Symptoms are insufficient without signs, and signs insufficient without a careful comparison of these with the symptoms. There is no such thing as a perfectly pathognomonic symptom or sign of any thoracic disease. We must combine the lights drawn from the careful study of symptoms, both past and present, with the observation of physical signs, for by this mode alone, can we hope to arrive at an accurate result. Great injury has been done to the cause of physical diagnosis by some inexperienced men, who, departing from the principles of its illustrious founder, have neglected too much the study of symptoms. To this subject I shall hereafter recur.

Let us now enumerate the sources of physical diagnosis.

1st. *Signs* purely acoustic, including the results of percussion and of auscultation, mediate and immediate. It may be observed here, that of all the signs these are of the most universal application; there being no disease of the lung or heart in which they do not occur.

2nd. *Signs* derived from the alterations of shape and volume of the thorax. This source of diagnosis is capable of application to many, though by no means to all the diseases of the lungs, heart, and great vessels. Changes of shape and volume imply either the existence of acute diseases, in which the products of the disease have rapidly accumulated, or, which is the more frequent case, of diseases which have a great degree of chronicity. Under the first head we may reckon rapid liquid effusions into the pleura or pericardium, the result of inflammation; and recent pneumothorax from fistula. Under the second, we have chronic liquid and æriform effusions; hypertrophy and atrophy of the lung, both the result of chronic disease; and aneurismal or other organic tumours.

3rd. *Signs* referrible to the sense of touch: these we find to occur in a considerable number of thoracic diseases, as, for instance, in bronchitis with effusion, in dry pleurisy and pericarditis, in various diseases of the heart and great vessels, in abscesses of the lung communicating with the bronchial tubes, and in certain cases of liquid effusions into the serous cavities, and in hepatization of the lung.

4th. *Signs* derived from the inspection of the motions of the thorax during respiration: these occur in cases of local or general impermeability of one lung, and in cases where the motions of respiration are otherwise impeded or altered.

5th. *Signs* derived from the inspection of the thorax with reference to the action of the heart and great vessels.

6th. *Signs* derived from the existence of an external collateral circulation, as indicative of the existence of obstruction of the great internal venous trunks, such as the cava and innominatæ.

7th. *Signs* derived from the observation of the displacement of the thoracic or abdominal viscera: of these, some may be appreciable by the senses of sight and touch merely, while others must be ascertained principally by that of hearing. The displacement of the heart (perceptible to the eye and touch) and the protrusion of the liver into the abdominal cavity are examples of the first division; while the displacements and compression of the lung from liquid or aeriform effusions into the serous sacs furnish examples of the second.

Now it is never to be forgotten, that although in these various classes we have a vast number of well marked and essentially differing physical phenomena, *there is not one of them which, taken singly, can be considered as a pathognomonic sign.* Nay, *we might go farther and declare, that no possible combination of them can be considered absolutely pathognomonic.* By some of them, taken singly, or by various possible combinations, we may, indeed, ascertain the existence of certain mechanical conditions of the intra-thoracic viscera, as, for instance, permeability or impermeability, increase or diminution of the quantity of air, the existence of cavities of various sizes and with various communications, the roughened state of a serous membrane, or the displacement of particular organs; but if we seek to determine by physical signs alone, the cause of all or any of these phenomena, we shall find it to be difficult or impossible. It is only, as we have said before, by the connexion of the accurately ascertained physical signs with the previous history and actual symptoms of the case that a correct diagnosis can be ever arrived at.

In order to establish the proposition, that no physical sign, taken singly, can be considered as pathognomic, let us take a brief review of these different signs, commencing with those least frequently applicable, and proceeding to those of most common occurrence.

1st. *Existence of an external collateral venous circulation.*

This appearance, which has been described by Reynaud, is indicative of a great amount of obstruction to the internal venous circulation. But of the nature of that obstruction it alone can tell nothing. It may proceed from the pressure of a tumour, aneurismal or otherwise, or from disease on the internal surface of the venous trunk itself. This was observed to occur in the vena portæ and inferior cava in a patient whose case is described by the same author, and in whom the superficial veins of the abdomen took on a supplementary action.

In obstructions at the right side of the heart, the dilatations of the jugular veins, so long noticed, seems to be the commencement of the same morbid appearance, and Dr. Graves has shown, that a varicose state of the superficial thoracic veins may occur from cancerous degeneration of the lung itself.

If, for the sake of argument, we assume that these different causes for the appearance in question were of equal frequency, and, that from it alone we determined on the existence of any one of them, there would be four chances to one against our making a correct diagnosis.

2nd. *Signs derived from the displacement of the thoracic or abdominal viscera.*

Of these, those that are most frequently recognized are the displacements of the heart and liver; the first is commonly observed in cases of empyema, the displacement to the right of the mesian line occcurring in empyema of the left side, while that in the opposite direction indicates accumulation in the right pleura. Now, although displacement of the heart to the right side of the sternum constitutes one of the best indications of empyema of the left pleura, yet taken alone it is any thing but unequivocal. A tumour or an hypertrophy of the left lung may produce a pulsation to the right of the sternum; the same may be caused by an hypertrophy and dilatation of the right cavities of the heart. And Dr. Graves and I have shown, that an aneurism of the aorta may push the heart to the right side. I have also published the particulars of an extraordinary case of dislocation of the heart from external violence, in which the organ was driven far to the right of the mesian line, and in which no sign of empyema of the left pleura had ever occurred. When I come to treat of the affections of the heart I shall give the particulars of this case. Lastly, well attested examples of congenital displacement of the viscera have been recorded, in which the heart was placed at the right of the mesian line. On the other hand, displacement of the heart towards the left axillary region is a circumstance, which, from its nature, is commonly overlooked, and which may occur from other causes. I may also remark, that the previous contraction of either side from a former attack of pleurisy should be added to the possible uncertainties of this source of diagnosis, for, in such cases, the heart seldom resumes its normal situation with respect to the healthy side.

As the displacement of the heart, considered alone, and without reference to any acoustic observation, is reducible, as a sign, to the mere feeling or seeing its pulsations in an anormal situation; so, the displacement of the liver is reducible to the observation of a tumour in the right hypochondrium. Now, even supposing that the case was one of displacement of the liver, it will be shewn that this might arise from other causes than empyema, to which it is commonly attributed: intra-thoracic tumours may produce it. I have observed it from Laennec's emphysema; it may occur from aneurism of the abdominal aorta, or from that of the hepatic artery; and I need scarcely remark, that we may have hepatic tumours, independent of any disease of the pleura, and conversely, pleural effusion without this sign. These observations are sufficient to shew, that displacements of the heart or liver cannot alone be looked upon as certain diagnostics of the lesion which has produced them.

3rd, *Signs derived from the inspection of the motions of the thorax during respiration.*

I shall not occupy the time of my readers with any commentary upon this class of signs. The respiratory movements are so infinitely various in the different diseases of the chest, that we are not warranted in founding any certain diagnosis upon the observation of them alone.

4th. *Signs referrible to the sense of touch.*

This class presents to us several signs, which, as far as they go, lead to a greater degree of certainty than those in the preceding one. Yet, like the other physical signs, they only reveal to us, and that not constantly, mechanical conditions, without leading to the diagnosis of the nature of disease, or the pathological state of the viscera. Thus, the bronchial vibration may occur from any liquid effusion into the tubes, and with various states of the lungs. The feeling of gurgling may proceed from a tuberculous, pneumonic, or gangrenous abscess, or from a dilated tube containing muco-puriform matter. The cause of the sensation of friction has not been sufficiently investigated, but we know that the rubbing feel may arise in various states of the serous membranes; while that of non-expansion of parts of the lung, will obviously be produced by many different causes. The cases in which the sense of touch leads us to most certainty in diagnosis are those of the diseases of the heart and great vessels; yet every practical man knows, that the most violent impulses occur without organic disease of the circulating system, while, on the other hand, extensive hypertrophy of the heart may exist with a natural impulse, and an aneurism of the aorta give no morbid pulsation.

5th. *Signs derived from alteration in the shape and volume of the thorax.*

In this class of signs we meet with some of considerable value; thus, the convexity of the chest in Laennec's emphysema, when carried to a great degree, is an appearance almost peculiar to the disease; and which, combined with the elevated shoulders and the hypertrophied state of the muscles in the neck, will scarcely mislead. But of the various partial dilatations and contractions, there is no one at all pathognomonic: many of them may be congenital, or the result of former, and of various diseases. Thus, dilatation of either side may arise from emphysema, pneumo-thorax, pleural effusions of various kinds, effusions into the pericardium, enlargements of the liver, or aneurisms of the aorta. An apparent dilatation too, may exist, in consequence of the contraction of the opposite side; and contraction itself may arise from a variety of morbid causes, or be a congenital conformation.

6th. *Signs referrible to acoustics.*

These have been hitherto divided into those obtained by *percussion*, and by *mediate* or *immediate auscultation ;* a division which seems to be unnecessary, as both classes of signs being appreciable by the ear alone, should be ranged under the general head of *auscultatory phenomena*. Under this head, therefore, we shall treat of Percussion, and Auscultation, whether Mediate or Immediate. Previous, however, to our entering on an investigation of their value as diagnostic means, we shall briefly describe the principles of these modes of diagnosis. It is plain, that we have acoustic phenomena referrible to a passive and an active state of the lung; in other words, to conditions, on the one hand independent of motion or life, and on the other, inseparable from them. The passive phenomena, or those of percussion, which relate merely to the quantity of air within the thorax, may be as well observed in the dead as in the living body; while the active, or those of respiration, the voice, or the phenomena of the heart and arteries, imply motion and life. Hence, we may divide the phenomena of auscultation into those of the passive and active conditions.

PASSIVE AUSCULTATORY PHENOMENA.

The great object of percussion is to determine the diminution or increase of the quantity of air within the thorax, or in certain portions of that cavity. It has been already observed that of the different cavities in the body, the chest is that in which the existence of air in quantity is a natural condition; and it need scarcely be repeated, that in the normal state of the cerebro-spinal cavities, air, in a free state, is always wanting. We know, also, that when it occurs in any part of the abdomen, it is either the product of disease, of the fermentation of the ingesta, or of a secretion from the mucous surface, by no means constant in its occurrence or quantity; but the chest is the great receptacle for air, and from the first moments of extra-uterine life, contains a vast quantity of it. Upon this peculiarity does the employment of percussion depend, because, *cæteris paribus,* the sound on percussion is directly as the quantity of air contained within the thorax.

Now, the result of almost every organic disease of the lung or heart is to diminish or increase the capacity of the thorax for air, and consequently to diminish or increase the sound on percussion; bearing this in mind, we find that the greater number of thoracic affections tend to diminish the quantity of contained air, and consequently are accompanied by a proportional decrease of sound, while the smaller (very few in number) have the opposite effect and results. If we consider that the general result of most of the organic diseases is to cause impermeability of the lung, produced either by deposition within, or pressure without the organ, we shall see that the principle above stated holds good: thus, in pneumonia, congestion, œdema, pulmonary apoplexy, tubercle, cancer, and hydatid of the lung, portions of the lung, more or less extensive, which had previously contained air, are now filled by a fluid or solid substance. Even in bronchitis, we can have no doubt, that the sound on percussion is diminished in proportion to the turgescence of the mucous membrane, a fact observed by Avenbrugger in the exanthematous diseases. It is true, that the diminution of sound is generally so slight as to escape our means of detection; yet that it exists even in the first stages cannot be doubted; and when secretion takes place to any degree into the bronchial tubes, the diminution of the quantity of air can be generally detected by percussion.

The same result is observed in all those cases of disease of the pleura or pericardium, in which a liquid effusion occurs. In these cases, as in the former, we see a similar effect, though from a different cause: namely, the obliteration of air cells, the diminution of the quantity of air, and the occupation of its situation with reference to the thorax, by a medium giving a dull sound on percussion. The same remarks are applicable to enlargements of the heart, aneurisms of the aorta, and organic tumours exterior to the lung.

Of those diseases, in which an increase of the quantity of air, and consequently an increase of the sound on percussion, are results, we have but two: namely, dilatation of the air cells, and pneumo-thorax. It seems possible also, that an extremely anæmic state of the body, by diminishing the amount of the circulating fluid, may produce a morbidly clear sound on percussion, and that in this way, we may explain the extraordinary clearness observed in many phthisical patients, even though the lung contains considerable quantities of scattered tubercle.

I shall now briefly recapitulate the principal thoracic affections, with reference to the result of percussion.

First.—*Diseases causing a diminution in the sound on percussion.*

The different forms and stages of pneumonia, serous and sanguineous congestions, pulmonary apoplexy.

Tubercle, cancer, melanosis, hydatids.

Bronchitis in its first and second stages.

All liquid effusions into the pleura and pericardium.

Active and passive enlargements of the heart.

Aneurisms of the aorta or innominata.

Organic tumours of the mediastinum, pleuræ, pericardium, or heart.

Secondly.—*Diseases causing an increase of the sound on percussion, either partial or general.*

Dilatation of the air cells.

Hypertrophy of the lung.

Pneumo-thorax, with or without fistula.

Pneumo-pericardium.

Now, the great point, as connected with the applicability of percussion to diagnosis is, that these diminutions or augmentations of the quantity of air being almost always partial, give consequently, partial phenomena. A circumstance admitting of the application of comparison, which, as we have said before, is so important in physical diagnosis.

For example, in the case of solidification of one lung, although, for the sake of argument, we may suppose that the quantity of air within the thorax is diminished by one half; yet, it does not follow, that the sound on percussion of the whole thorax is proportionally lessened. For the healthy side retains its natural sound, or at all events gives a sound so little diminished, as by no means to interfere with the comparison of the healthy with the diseased lung. Again, in a case of incipient phthisis, the upper lobe of the lung is tubercular; yet, this diminution of the quantity of air does not affect the sound of the lower portions; and hence, a comparison between them can be established, and the disease be thus detected. Further, in a case of pneumo-thorax, or of partial dilatation of the air cells, the increase of sound is only partially observed, the healthy portions giving less resonance on percussion; so that here also, comparison can be established. I am aware, that, reasoning upon strictly physical principles, we should expect some diminution or increase of sound in the healthy portions; yet, if this does occur, the alteration is so slight as not to interfere with the facility of diagnosis, unless in extreme cases of disease. It is plain, that if such alteration occur, it will interfere more with the comparison of the parts of the affected lung among one another, than to that of the diseased with the healthy lung.

ACTIVE AUSCULTATORY PHENOMENA.

The principle of diagnosis, founded on these signs, is extremely simple. I may give the following explanation of this principle.

The manner in which the stethoscope assists us in detecting the state of the thoracic viscera can be explained in a very few words. The air, as it passes through the lungs in the acts of inspiration and expiration; the sound of the voice in different parts of the chest; and the impulse and sound of the heart at each pulsation, have all certain characters in the state of health. They present phenomena, which are to be considered as standards of comparison. Now, every disease of the lungs and heart alters or modifies these characters, according as the case may be; and it is by the knowledge of the *morbid phĕnomena* or deviations from the natural state, that we may judge of the state of the thoracic viscera.

I need scarcely remark, that I do not maintain, that health implies an identity of phenomena in every individual; the signs in a child differ from those in the adult, those of the female from those of the male; and there are other cases of natural modification, but still, taking these circumstances into consideration, the active auscultatory phenomena of health have a sufficiently constant character to deserve the name of standards of comparison, and to be used as such.

The active auscultatory phenomena may be classed as follows:

I. Sounds of respiration :—

Tracheal.

Vesicular.

II. Sounds of cough.

III. Sounds of voice.

IV. Sounds of the heart and great vessels.

Now, the effect of disease is two-fold: it modifies these phenomena, and it gives rise to new and non-analogous signs; so that we have active auscultatory phenomena of health,—next, modifications of these, produced by disease; and, lastly, entirely new active auscultatory signs, whose existence is solely the result of a diseased state: as for instance, the different rales; the metallic phenomena; the rubbing sounds of the serous membranes; and the various murmurs of the heart and great vessels, &c.

Having now given a short sketch of the sources of physical diagnosis, I shall announce the great principles that govern their application to the detection of disease; these may be stated as follows:—

First.—That the value of most of the preceding signs, or of their combinations, in the determination of the seat, nature, or extent of disease, is to be estimated more by comparison with the phenomena of other portions of the chest, than by their mere existence in a particular situation.

Second.—That the greater the number of physical signs which can be combined in any particular case, the more accurate will our conclusions be. But of these combinations, the most important and indispensable is that of the passive and active auscultatory phenomena.

Third.—That the existing physical signs are to be considered in relation to the period of duration of the disease, and the rapidity or slowness of their own changes.

Fourth.—That in all cases, the value of physical signs must be tested by the existing symptoms and previous history; while on the other hand, the observation of these physical signs, enables us to correct the conclusions to which we would be led by the unaided study of symptoms.

I shall first proceed to the elucidation of the principle of *COMPARISON.* This principle, which may be said to be the basis of physical diagnosis, has not been sufficiently insisted on, either in the work of Laennec, or of any of the succeeding writers on auscultation. Indeed, Dr. Williams is the only author who alludes to the subject.* But even this author does not sufficiently insist on its paramount importance, and refers to it principally as connected with the use of percussion. "A person commencing the practice of percussion, will be guided more safely by the comparative than by the absolute sounds of different parts of the chest; and although he should lose no opportunity of acquainting himself with the sounds, both of percussion and auscultation, in healthy subjects, he should in case of disease, more particularly at first, direct his attention to irregularities or want of correspondence of the two sides in the same subject. In instituting this comparison, he should be careful, likewise, to practise percussion on corresponding parts of the two sides, and with such an attention to the manner in which his fingers fall, and, if he uses the digital pleximeter, the manner in which this is placed, that any difference of sound may not arise from these fortuitous circumstances."

But the principle of comparison must be applied to *all the means* of physical diagnosis, and must never be lost sight of, either by the tyro or the most practised investigator of disease; for, as will be shewn, it is the only mode of avoiding error.

We have already seen how beautifully the anatomical structure of the thorax favours the application of this principle; the organs in this cavity being more remarkably and completely separated than those of the cranium or abdomen. From this circumstance two important consequences are derived: first, the facility of comparison of the different portions, and next, the circumscription of disease.

Let us now take some examples of the value of comparison. Feebleness of respiration occurs in many diseases of the lung.

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* Rational Exposition of the Physical Signs of the Diseases of the Lungs and Pleura.

Now, suppose we are called to examine a patient with symptoms of incipient phthisis, we may find the vesicular murmur under the clavicle exceedingly feeble, a character of common occurrence in cases of tubercular disease; yet, if from this alone we were to conclude, that the case was really phthisis, we might be altogether wrong, for many persons have a naturally feeble respiration over the whole chest. In such a case, the sign of feebleness of respiration under the clavicle might be of no value, for it would be only the natural character of the respiratory murmur. But suppose that, in another case, we found the same feebleness of respiration in the same place, and not content with this superficial examination, we explored the opposite side, and found the respiration there unusually loud, then, indeed, the feebleness of respiration would become a sign of positive value; because, under such circumstances, experience tells us, that in most cases, it is actually produced by tubercular development. Thus, in this instance, the sign derives its whole value from comparison.

Let us now take the opposite case: there is a character of respiration, termed puerile, from its resemblance to that of children, and which commonly occurs in cases where some other portion of the lung has been disorganized. But the mere circumstance of hearing puerile respiration in one portion of the lung, is by no means a conclusive proof of the existence of disease in some other part, for, in certain cases, the respiration is universally puerile, independent of any disease; it is only the co-existence of puerility in one portion and feebleness in another, that gives any value to the sign; in other words, it is by the test of comparison that its value must be estimated.

The same observations apply to the phenomena of the voice. An increased resonance of the voice is a common sign of solidity of the lung, but one of no value, except by comparison, for many persons present a natural bronchophony over a large portion of both lungs. But, where the resonance is loud and distinct in one lung, and either wanting or much less intense in the corresponding portion of the opposite one; it then becomes a sign of decided value. I might also extend this to the sign of pectoriloquism, about which, such a quantity of error is extant. Some persons are naturally pectoriloquous in the upper portions of the lungs; and it is plain that, in such cases, the discovery of the phenomenon under the clavicle, or over the shoulder of one side, might lead to great error unless tested by comparison.

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The following is an important and common illustration of the value of comparison. A patient presents the symptoms of cough, muco-purulent expectoration, accelerated breathing and pulse, emaciation, and hectic. Under these circumstances, we detect a mucous rattle in the subclavicular region; a sign which, when properly estimated and corrected, may lead to an almost positive diagnosis of phthisis, with softening of the tubercles. Now if, in a patient labouring under the above symptoms, we were to conclude from the mere existence of this sign in this situation, that the case was really phthisis, we might fall into error, for a comparative examination of the different portions of the chest might shew, that the rale was universal; a discovery, which would greatly diminish its value as a sign of phthisis, and leave a probability that the case was one of bronchitis, with copious effusion into the smaller tubes. In such a case, the value of comparison is obvious.

On the other hand, the existence of rale, either under one or both clavicles, while the inferior portions remained free, would, when occurring with the symptoms described, be a most important diagnostic of phthisis.

Comparison must be used in determining the value of the modifications of the original active phenomena, as well as of that of the new or non-analogous signs. A good example of this is seen in the detection of foreign bodies in the bronchial tubes, for it is principally by the comparison of the respiratory sounds in both lungs, that the diagnosis of a foreign body can be arrived at: to this subject I shall return hereafter.

may also observe, that in certain cases of aneurism of the aorta or innominata, it is by a comparison of the respiratory murmur in either lung, that the existence of the tumour at an early period can be detected.

We get a good idea of the value of comparison, by reflecting that the cases in which diagnosis is most difficult, are those in which the phenomena are the same over the entire chest. There are two cases of phthisis in which physical diagnosis is extremely difficult; the one an acute, the other, a chronic case; yet, in both of which, the tubercle is equally and universally developed in both lungs, and consequently, similar phenomena being given by all parts of the chest, the diagnosis by comparison founded on the localization of disease, becomes inapplicable. The same remarks apply to the case of double empyema, in which we lose the advantages that the comparison of the differences between the physical phenomena of either side gives us in single pleurisy; and also to that of double and equal dilatation of the air cells, the detection of which must depend on the direct signs, and history of the case.

One of the most striking instances of the difficulties which arise when the application of comparison is fallacious, is that of the development of tubercle in a patient, whose chest has been deformed from previous disease. Patients who have recovered from empyema with a contracted side, are liable to tubercular development, and the stethoscopist may be called to determine the question, as to whether tubercle exist or not. I have been more than once in this situation, and believe that a more difficult case for diagnosis can hardly be met with. The symptoms will seldom afford any assistance, as they may proceed either from incipient phthisis, or be those commonly present during the convalescence from empyema. And in consequence of the previous disease of one pleura, and the contraction of the chest, we are deprived of the advantages of comparison of the phenomena of both lungs, by the stethoscope and percussion. Thus, if we find the side originally affected to be duller than the other on percussion, this may be explained either by the diminished volume of the lung, or by the development of tubercles. The same difficulty exists in the observation of respiration, and the phenomena of the voice. But if the opposite lung be the seat of tuberculous disease, we may detect the affection in its early periods; yet, in a remarkable case that I lately saw, and in which, after a comparatively rapid recovery from empyema of the left side, tuberculous disease set in; all the stethoscopic signs indicated disease in the left lung, and not in the right; and yet, on dissection, the right lung was found full of miliary and granular tubercles, while the left contained scarcely any. Of this, the preceding considerations afford an easy explanation. The left lung was dull on percussion, from its diminished volume; for the same reason, its vesicular murmur was feeble, while in the right, the disease had not become sufficiently extensive to cause a greater dulness, or even an equality of sound. It is plain, that under these circumstances, a greater amount of disease in the right lung would be required to lead to its detection, than in a case where the opposite lung had not been previously affected by empyema.

Independent of the importance of the principle of comparison, its practice in all cases is of the greatest utility, by leading to the discovery of lesions which would otherwise escape us. I remember being called to see a patient, who had received an injury of the side, and who was labouring under fever, cough, expectoration, and dyspnœa. His attendants had examined him repeatedly with the stethoscope, and discovered nothing but bronchitis. I had him stripped, and found the phenomena of empyema and pneumo-thorax in the lower part of the right lung; his attendants had examined the upper part of the chest carefully, but had neglected the lower, and thus the true nature of the disease had escaped them.

With respect to the heart, it is evident, that the diagnosis by comparison of signs with one another, is not so applicable as in the lungs. We are forced, in many cases, to depend upon the characters of isolated phenomena; and hence, the difficulty which attends the detection of diseases of the heart may be in part explained. If we consider the heart as a single organ, it is plain, that we have no standard for comparison, and the same observation applies, if we take it as a double organ; for the arterial and pulmonary hearts have original differences, whether anatomically or physiologically considered.

Yet, comparison is not wholly inapplicable in cases of diseases of the heart. By it, we may often determine the seat of disease, if not its nature; we also find it applicable in the diagnosis of certain cases of aneurism of the great vessels, as we shall see, when we come to treat of that subject.

In the progress of this work, I shall shew many other examples of the importance of comparison. We now proceed, to consider the next principle of physical diagnosis; namely, the combination of signs, and in particular, those drawn from percussion and the stethoscope.

For example: a patient is affected with stridulous breathing, and by percussion we discover that one clavicle is decidedly dull. This proves, that there is in that situation a diminution of the normal quantity of air; a condition generally produced by either pulmonary solidity, or by displacement of the lung from an aneurismal tumour. Here, to determine the important question, as to whether the case be disease of the lung or aneurism, the employment of the stethoscope becomes absolutely necessary. We must correct the passive by the active signs.

Again, suppose that we detect feeble respiration in any portion of the lung, we have a character which may be produced by essentially opposite states of the pulmonary tissue, in other words, by an increased or a diminished quantity of air. Percussion must be used to correct the stethoscopic observation. The active signs are to be corrected by the passive.

A patient has presented, for some time, decided dulness of the upper portion of one lung, and we find, subsequently, that this portion regains its sound. Now, this circumstance may be produced either by the formation of a cavity, or by the return of the lung to its healthy state. Here the observation of the active signs is necessary to determine the value of the passive.

A patient has presented the sign of friction, or the rubbing sound produced by the inflamed state of the serous membrane; and after a time, this active phenomenon is observed to disappear, which may result either from the cure of the disease, or the separation of the layers of the pleura or pericardium, by a liquid effusion. To determine the point, we must have recourse to the observation of the passive phenomena. If it be the former case, percussion will give a clear, if the latter, a dull sound.

In the case of a foreign body in the trachea, or the pressure of an aneurismal tumour on one bronchus, we may observe either complete absence or great diminution of the respiratory murmur in either lung. This modification of the active auscultatory phenomena, for its value in the diagnosis of aneurism, depends entirely on the result of percussion, as we shall see hereafter.

It is only by the combination of these two classes of signs, that we are able to arrive at the diagnosis of a rare, but most important disease, namely, acute general development of tubercle, with bronchial irritation. In many of these cases, stethoscopic observation can only detect intense bronchitis; and, without the aid of percussion, no other diagnosis could be arrived at. Now, acute bronchitis may exist with apparent clearness of sound; but if, in such a case, we observe an increasing and decided dulness of the chest, the diagnosis of a general development of tubercle may be often safely arrived at.

Many more instances, illustrative of the necessity of this and other combinations, will be given in the course of the work. I may, however, add one more common example. A patient has been attacked with symptoms of inflammation of the lung, and at an advanced period we find the affected side completely dull on percussion. This may arise either from a pleural effusion or a solidification of the lung, and the observation of the active phenomena will be necessary to determine the question.

Thus, the passive and active auscultatory signs mutually correct each other; yet, even their combination with all other classes of signs will be insufficient, if the history and symptoms of the case be not accurately considered and compared with them. In other words, it is not enough to compare one set of signs with another, but all the signs, whether acoustic or not, with the history and symptoms.

Let us next consider the physical signs in reference to the duration of the disease, and the rapidity or slowness of their own changes.

A patient, previously healthy, is attacked with inflammatory symptoms and pain in the side. Now, if in the course of twenty-four hours we find the affected side dull on percussion, a strong probability exists that the case is one of effusion into the pleura, rather than of hepatization of the lung. Let us, on the other hand, suppose that the symptoms have continued for a week or ten days, and that at the end of that time we find the sound clear on percussion, then, at all events, we may conclude, that the case is not pleurisy with effusion, or hepatization of the lung. It may be dry pleuritis, pleurodyne, or bronchitis.

We discover the signs of a cavity in any portion of the chest. Now, the determination of the nature of that cavity will depend much on the history of the patient. If he has been in good health, and free from pulmonary symptoms up to within a week or fortnight of the time when we have first examined him, the great probability is, that the cavity is not tuberculous. It may be a pneumonic or a gangrenous abscess. On the other hand, if the case has been chronic, in the ordinary acceptation of the word, the chances are, that the cavity is tuberculous.

Let us suppose that we discover an extensive gurgling over the upper portion of one side, and that the question arises, as to whether this is caused by an anfractuous phthisical cavity, or by dilated tubes. Here, along with other sources, the period of the continuance of the symptoms is a most important element in settling the question. If the patient has had similar symptoms for five, ten, or fifteen years, the chances are, that the case is one of dilated tubes, but if his symptoms have continued only for three or six months, then it would be almost certain, that the signs proceeded from a multilocular phthisical abscess.

It would be easy to shew, that many other diagnoses are founded on the connexion of the actually existing physical signs with reference to the period of continuance of symptoms. I may enumerate a few of these.

Foreign bodies in the trachea.

Acute general development of tubercle.

Laennec's emphysema of the lung.

Certain cases of empyema and pneumo-thorax.

Hydro-thorax.

Nervous palpitation of the heart, as distinguished from organic disease.

Pericarditis with effusion.

Rupture of an hepatic abscess into the lung.

Sympathetic cough.—This example, perhaps, requires some explanation. We may find in a case, where violent cough has existed, either that there is no physical sign of disease, active or passive; or, that if there be, the signs are insufficient to account for the symptoms. Now, these circumstances may arise either from incipient organic disease, or from mere functional lesion. If the symptoms have continued for a considerable length of time, the great probabilities are, that the case is one of original, or symptomatic neurosis of the lung.

The above instances are sufficient to shew the application of the principle of combination of the history of the case, *quoad* the period of duration of symptoms, with the actually existing physical signs. But we must go farther, and consider these signs with reference to the rapidity and slowness of their own changes. Perhaps the most interesting source of physical diagnosis is drawn from considering the signs, with reference to their permanence for certain periods, and the mode and order of their successive manifestations. One of the best examples of this is seen in the case of dilated tubes. It may be often difficult to pronounce whether the signs of an excavation proceed from a phthisical cavity, or from dilated tubes. Now, as a general rule, it may be stated, that the extension of the cavity is much more rapid in the former, than in the latter case; and from this we derive the following rule: that if, in any instance, we can recognize a rapid extension of a cavity, the case is not one of dilated tubes. If, in the course of a fortnight, or a month, the stethoscope indicates a decided increase in the size of the excavation, we recognize an ulcerative extension, rather than that almost imperceptibly slow process by which the bronchial tubes become dilated, so as to simulate abscess of the lung.

Again, we may experience difficulty in determining whether a patient labours under enlargement and valvular disease of the heart, or an aneurism of the ascending aorta. I have seen several of such cases, in which I at first suspected an aneurism; as much, if not more, from the history and symptoms as from the signs; but in which my suspicions were converted into certainty, from observing that the extension of the signs of dulness, pulsation, and the accompanying murmurs occurred much too rapidly to permit the supposition, that they proceeded from a further enlargement of the heart itself.

In the case of a foreign body lodging in the right bronchus, we have another excellent example of this source of diagnosis: the sudden suspensions and reappearances of the respiratory murmur in the affected lung, while the sound on percussion remains clear, point out sudden alternations of the conditions of permeability and impermeability in the corresponding bronchus. And it is scarcely necessary to observe, that these are circumstances only explicable on the supposition of a moveable foreign body existing in the tube. Indeed in the mode of succession of the various signs in the different thoracic diseases, we have a source of diagnosis of such importance, that it seems not impossible but that future investigation will show, that it is in this department, we are to seek for the perfection of physical diagnosis. For in many instances we find, that in different diseases the characters of the signs are identical, but their modes of succession are constantly and characteristically different.

For example, œdema of the lung presents a crepitating rale, often undistinguishable from that of pneumonia, as far as its physical characters are concerned ; but successive observations may determine the point. In œdema, the dropsy of the lung causes no further organic change, and the crepitus consequently persists, with little or no change, for a length of time, the sound on percussion remaining the same. On the other hand, there exists in pneumonia a cause which produces successive and important modifications in the structure of the lung ; and accordingly, we find corresponding changes in the physical signs. The crepitating rale by degrees masks the vesicular murmur, and as the congestion advances, gradually disappears, until impermeability of the cells and finer tubes is produced. We have then dulness of sound and bronchial respiration. But the changes do not stop here, for the lung may pass into suppuration, or return to health; in either of which cases, important changes in physical signs take place.

In these successive changes, then, is founded the physical diagnosis between pneumonia and œdema. I may here remark, as illustrative of the importance of studying the mode of succession of signs, that although there is no single sign in pneumonia which is pathognomonic, the possibility existing of every one of them arising from other causes ; yet we know of no other disease which presents, in its progress or resolution, the same mode of succession of phenomena. I have already stated, that no possible combination of signs can be considered as absolutely pathognomonic. The observations just now made are by no means contradictory of this, as they apply not to any existing combination, but to the successive developments of physical phenomena.

I might adduce many other instances of this mode of investigation, but enough has been stated to explain the principle. The preceding observations strongly illustrate one of the most important principles connected with the science of thoracic disease, namely, that it is not enough to be able to recognize, nicely distinguish and remember signs, but that we must know how to reason upon them. Here we see the fusion of the mechanical and the pathological parts of the science, learn their mutual dependence, and find why it is that the mere auscultator, or the mere symptomatologist, can never excel in the diagnosis of diseases of the chest.

I shall now, in conclusion, briefly allude to the absolute necessity of studying the symptoms in relation to the physical signs.

It is true, that the mere observation of certain physical signs may, under particular circumstances, lead us to conclusions probably correct, but the object of medicine is certainty. The existence of gurgling and cavernous respiration under the clavicle, tells of a cavity communicating with the bronchial tubes, and containing air and liquid; in other words, of an anormal physical change: so far we have certainty. From the relative frequency of its causes, we might say, that the cavity was probably phthisical, but the possibility would exist of its being a dilated tube, a pneumonic, or a gangrenous abscess.

Again, the occurrence of metallic tinkling, and amphoric resonance, points out the presence of a vast cavity communicating with the bronchial tubes, and containing air and liquid; and in like manner, from the comparative frequency of its cause, we might conclude that the case was probably an example of empyema, pneumo-thorax and fistula; but on the other hand, these phenomena may occur from an essentially different pathological condition of the lung; nay, further, we shall find, that some of the metallic phenomena may arise from sources altogether external to the thorax.

Let us take a few more examples, illustrative of the insufficiency of mere physical diagnosis. It is commonly held by those who are but partially acquainted with auscultation, that the crepitating rale is a sign of pneumonia: that it is so is true, but in some of its forms, it may occur in other affections. Let us suppose that we are called to a patient whom we have never before seen, and with the history of whose case, or his present symptoms, we are ignorant, and that on applying the stethoscope to the postero-inferior portion of the right lung, we discover a crepitating rale, we have then a phenomenon which may be produced by many essentially different causes; and were we to make the diagnosis of pneumonia, our opinion would rank nothing better than a mere guess. Among its various causes, the phenomenon might be produced by the following: acute pneumonia in the first, the suppurative, or the resolutive stage; chronic pneumonia, congestion, œdema, mucous catarrh, tubercle, hepatic abscess opening into the lung, pulmonary apoplexy. Now, supposing that these were all the possible causes of the phenomenon, and that their occurrence was of equal frequency, and that without an accurate investigation into the history and symptoms of the case, we concluded that its cause was an acute pneumonia in the first stage, there would be nine chances to one against our guessing right. But if this crepitating rale was observed in a patient, who had been but twenty-four or forty-eight hours ill, and had previously no symptoms of pulmonary disease; if he had inflammatory fever, pain of the side, cough, acceleration of breathing, and viscid expectoration, we might safely conclude, that its cause was an acute pneumonia in the early stage. Again, if it occurred in a patient who had been attacked some days before with the constitutional symptoms of pneumonia, which had subsided after judicious treatment, and in whom there had been pain of the side which had disappeared; bloody and viscid expectoration, which had been succeeded by a clear or concocted mucus; dulness of sound and bronchial respiration, which had subsided or was diminishing; we might safely conclude, that the rale was an example of Laennec's crepitus of resolution. Lastly, if it occurred in a patient in the advanced stages of pneumonia, in whom the powers of life were sinking, who had the prune juice sputa, or was expectorating a yellow purulent matter, and in whom the affected portion of the chest sounded absolutely dull and with distinct bronchial respiration, we might safely declare that the lung was in the third or suppurative stage. It is true, that differences in the character of the sign in these different stages may exist, and be appreciable, but my experience leads me to the firm belief, that in testing the value of any sign, we are to look more to the history of the case, and the accompanying physical and vital phenomena than to its absolute character. Here, I am anxious not to be understood as depreciating the importance of studying the actual characters of physical signs. On the contrary, I am convinced, that the more the ear is accustomed to appreciate minute differences of sound, the greater will be our accuracy in detecting the nature of disease. But while I do not deny the possibility of training the sense of hearing to such a pitch of accuracy, as that from the character of sounds we may yet, in certain cases, infer the vital cause of phenomena, I feel, that this perfection is not easily attainable, and at best, can be enjoyed only by the few. And it must never be forgotten, that disease occurs under infinitely numerous modifications, so that the result being the same, the physical phenomena may not be absolutely similar.

Again, we meet, under the same circumstances, a patient with feebleness of respiration, and dull sound on percussion in the same situation; this may depend on inflammatory, tubercular, or cancerous solidification of the lung, pulmonary apoplexy, empyema, hydro-thorax, contraction of the chest from a former attack of pleuritis, enlargement of the liver, pushing up the diaphragm, ascites, and aneurism of the aorta. Here the same observations, as in the former case, evidently apply.

The same train of argument is applicable to most of the other classes of physical signs, as will be abundantly shown when I come to speak of the diseases in particular.

It has been objected to the advocates for the stethoscope, that they discard the consideration of symptoms, and that throwing over board all the knowledge we possessed previously to the introduction of auscultation, they pretend to ascertain the existence of all diseases of the chest by the sole observation of physical signs. There is only one answer to be made to this objection, namely, that it is wholly groundless; indeed those who make it only betray their ignorance of the subject. Laennec never taught that auscultation could supersede the mode of examination by symptoms; on the contrary, he devotes a considerable portion of his work to their history and analysis, and in many places, especially insists on the necessity of their careful study. He gives instances where the physical signs having been accurately observed, the history and symptoms of the case were alone to determine the nature of the disease: thus in describing a case of dilatation of the bronchial tubes, he states that the physical signs allowed of two suppositions; either that of an extensive dilatation of the bronchial tubes, or of a multilocular phthisical excavation;—"I determined however on the first diagnosis," says Laennec, "from the general state of the patient and the history of the disease." Andral, who is the second writer on auscultation, devotes a large portion of his work to the examination of symptoms; so do Louis, Bertin, Forbes, Duncan, Elliotson, Hope, Williams, and all other writers of any authority on the subject.

It is true that combinations of physical phenomena may sometimes arise, which would lead to a great degree of probability, indeed almost a certainty in diagnosis. A patient with a dilated side, giving morbid clearness on percussion, with the sound of fluctuation on succussion, and in whom also the stethoscope detected the metallic tinkling, &c., might be said, with almost positive certainty, to labour under empyema, pneumothorax, and pulmonary fistula: but such cases, or those analogous to them, are comparatively rare; and even in the case in question, the cause of the fistula would be undetermined. In the cases we are every day called to treat, the *value of physical signs must be tested by the history and symptoms, and these in their turn must be corrected by the physical signs.* Whoever neglects either source of information will fall into the most fatal errors. We must have recourse to the assistance of each and every one of these means; and even still, with all this combined knowledge, we shall meet with cases, the real nature of which is involved in the greatest obscurity. Indeed, when we reflect on the infinite complications of disease, modified by circumstances infinitely numerous, it would be strange if such did not arise, and there can be no doubt, that if our means of diagnosis were extended one hundred fold beyond their present state, the same circumstances would still occur. Physical signs form an addition, constitute an assistance to diagnosis, but nothing more; yet of their value every impartial mind must be convinced, who compares the state of our knowledge previous and subsequent to their discovery. It is on the discovery, explanation, and connexion of these signs with organic changes, and with the symptoms and history of the case, that Laennec's imperishable fame is founded. Time has shewn that his principles of diagnosis were not the bagatelle of a day, or the brain-born fancy of an enthusiast, the use of which, like the universal medicine, was to be soon forgotten, or remembered only to be ridiculed. It has shewn that the introduction of auscultation, and its subsidiary physical signs, has been one of the greatest boons ever conferred by the genius of man on the world. A new era in medicine has been marked by a new science, depending on the immutable laws of physical phenomena, and, like other discoveries, founded on such a basis, simple in its application and easily understood. A gift of science to a favoured son: not as was formerly supposed, a means of merely forming a useless diagnosis in incurable disease, but one by which the ear is converted into the eye; the hidden recesses of visceral disease opened to the view; a new guide in the treatment, and a new help in the early detection, prevention, and cure, of the most widely spread diseases which afflict mankind.

In conclusion, I would refer to one of the most essential points as bearing on the diagnosis of chest disease, namely, the co-existence of morbid action in the different tissues or structures of the lung. In a practical point of view the lung may be considered as consisting of three different parts or tissues. We have in the first place an extensive mucous expansion, forming the internal or lining membrane of the lung, and which may be described as commencing at the rima glottidis and terminating in the air cells. We have next, these air cells, and their connecting cellular tissue, forming, with their bloodvessels, what is called the parenchyma of the lung; and lastly, we have its external serous covering, the pleura.

From this division authors have arranged pulmonary affections into those of the mucous membrane, those which involve the air cells and intervesicular cellular tissue, and lastly, those affecting the serous covering. Under the first they class the different varieties of laryngeal, tracheal, and bronchial disease; under the second, such affections as pneumonia, tubercle, pulmonary apoplexy, &c., &c., and under the third, we have the different forms of pleuritic inflammations, and the various effusions into the cavity of the pleura.

This division, though convenient in the writing of systems, and to a certain degree applicable in the practice of medicine, is found to fail when we accurately consider the symptoms and pathology of thoracic disease. In many cases, indeed, do we find it impossible to draw the line of distinction between the affections of these different elements, for not unfrequently the diseased action extends more or less to them all. We have bronchitis combined with pneumonia, pneumonia complicated with pleuritis, and very frequently the three lesions co-exist; an observation which applies both to the acute and the chronic diseases of the lung. In the treatment of pulmonary affections it is of the utmost importance to bear this principle always in view.

For example, in almost every instance of acute pneumonia there is bronchitis also, a circumstance never to be forgotten in the treatment and progress of the case. For in many instances, after the relief of the pneumonia, properly so called, we have to contend with an extensive and severe bronchial inflammation, which if unrelieved, may cause the death of the patient. And the importance of this is further shewn, if we recollect that the mode of treatment of the two cases is not the same, and the source of danger and the effects on the economy totally different.

But the complication with bronchitis is not the only one to which such a case is subject, for disease of the pleura is perhaps as frequent, from whence the term pleuro-pneumonia, one applicable to the great majority of cases. It is true that the pleuritic inflammation is generally of the dry kind, and hence of less importance; but the reverse may occur, and a purulent effusion, or a serous collection, form in the cavities of the pleura; so that in certain cases the practitioner, ignorant of these facts, might suppose that he was contending with hepatization of the lung, when in truth his patient was labouring under empyema or hydrothorax.

Again, let us consider the ordinary case of tubercular consumption. Were we to confine our ideas of this affection to the mere growth and suppuration of tubercles, we would have indeed a most limited and erroneous view of the disease. For in this affection we have not only tubercle in every stage and form, but also the extension of disease to all the tissues of the lung. Many varieties of pneumonia may occur, and the disease in the abstract is a common complication, producing the most important modifications in the symptoms and progress of the case. If we consider the mucous membrane we shall find the same remarks to apply; many cases appear to commence by bronchitis, and in their progress the state of the mucous membrane comes to be of the utmost importance. Every form of disease may, and commonly does occur, and bronchial secretion is frequently the chief source of the wasting expectoration.

If we now examine the serous membrane we find evidence of extensive disease. In the great majority of cases, adhesions—sometimes so complete as to obliterate the whole sac—thickenings, effusions, or even ulceration with a fistulous communication passing inwards, are common occurrences. This frequent complication of pleuritis in consumption, as we shall find hereafter, may be considered as a great good; for in many cases it may be looked on as one of the processes of nature towards bringing about a cure.

It may be laid down as a general principle, that in many acute, and in almost all chronic affections of the lung, we find these three tissues more or less engaged. In one case the disease predominates in the bronchial mucous membrane, in another, in the parenchyma, in a third, in the pleura; yet still the principle will be found very generally true, and its practical application is sufficiently obvious. But as in the present state of our pathological knowledge, we must admit that cases are to be met with, in which disease seems to be confined to a single tissue, and further, that even in the complicated cases, disease may be traced as commencing in one tissue and then extending to another, it becomes convenient to study the affections separately; and experience shews that the principles of treatment should vary according to the isolation or predominance of irritation in any of these three essential elements.

Now the knowledge of these facts is of the utmost importance to the student of physical diagnosis, and will remove many difficulties which must otherwise occur in the course of his investigations. Thus, in a case of bronchitis, he will be prepared to meet with dulness of sound on percussion, resulting from an accompanying congestion of the vesicular structure, or the sound of frottement from the deposition of lymph on the pleura, or even œgophony from a slight liquid effusion. Nor will he be surprised or puzzled, if, in a similar case, the signs of a pneumonia or a hydrothorax should supervene. In a case of partial pneumonia, the existence of a sonorous or sonoro-mucous rattle in the other portions of the lung will not embarrass him. He gives to the first case the denomination of bronchitis, because he finds that irritation predominates in the mucous membrane, and although there may be signs of sanguineous congestion, or even of pleurisy, yet these seem of comparatively little importance, and their treatment may often be merged in that of the prominent inflammation. On the other hand these may become sources of danger, and for this he is prepared. So also in the case of pneumonia, the extent and character of its proper signs enable him to recognize the disease, even although more or less of bronchitis or pleurisy may co-exist. The same observations will apply to the diseases of empyema and phthisis; in the first of which the signs of bronchitis so commonly occur, and in the second, where there is scarcely a physical sign of pulmonary disease that may not arise.

SECTION II.

BRONCHITIS.

THIS affection, in its simple or more complicated forms, presents the strongest claims to our attention. In fact, its study furnishes us with a key to thoracic pathology, as in a great number of pulmonary, and even cardiac diseases, the inflammation of the mucous membrane of the lung seems to be the first link in the chain of morbid action; a circumstance illustrative of the proposition of Broussais, that the various external morbid influences which affect the system are first exercised on one of the surfaces of relation, viz.: the skin, the bronchial, and the gastro-intestinal mucous membrane.

When we reflect on the various forms of this disease, and on the number of secondary affections to which it may give rise, its importance is obvious; and we shall find that many examples of diseases, which have received a separate name, have commenced by this lesion, or are complicated with it. We frequently find it a prominent feature in what have been termed the nervous affections of the lung; we know that it may give rise to dilatations of the air cells and tubes, and to pulmonary emphysema; that it may have been the first lesion in many cases of ulceration of the cartilages; that there is a close connexion between it and inflammation of the substance and the serous membrane of the lung; that many cases of phthisis seem to commence by this affection, and that it may ultimately cause morbus cordis, and all the evil consequences resulting from obstructed circulation.

We further find that bronchitis is present, and has a most important share in almost all diseases of the lung, whether acute or chronic. Thus, in most cases of pneumonia, there is distinct evidence of bronchitis; a complication which, according to circumstances, may be of the greatest advantage or danger to the patient. It is a constant complication in pleuritis, particularly of the chronic form; while in phthisis, according to the best pathologists, the bronchial mucous membrane rarely escapes disease. It occurs in Laennec's emphysema, in many cases of pulmonary apoplexy, in cancer of the lung, and other affections.

Further, it is ascertained that bronchitis is the most common result of the sympathetic irritations of the lung. It forms an important part of the phenomena of many of the eruptive diseases, while in fever, taken in its ordinary acceptation, it is exceedingly frequent, and too often the direct cause of a fatal termination. From my experience, I would say, that many patients would recover from fever but for the occurrence of this disease.

In classifying the different forms of bronchitis, we may take, for the basis of our division, the different immediate results of irritation of the mucous membrane and glands. In the first, or most ordinary form, we have a mucous, and afterwards, a muco-purulent secretion; in the second we have a secretion bearing the character of lymph, as in some of the forms of croup; in the third, the secretion is principally serous, as in the different forms of humid catarrh and asthma; while in the fourth, there is little or no secretion, a disease which has received the name of the dry catarrh. It may be remarked, that in certain cases, the more copious and elaborated the secretion, the greater is the relief produced; thus a mucous expectoration gives more relief than a watery; a muco-purulent, more than a mucous; and a purulent, perhaps, more than any.

All ages are subject to this disease. It may be even congenital; and either as a simple affection, or combined with other inflammations, such as pneumonia, pleurisy, or gastro-enteritis, is not uncommon in the earliest periods of extra-uterine life. It is stated by Billard, that in some cases the disease is extremely latent, and that although an infant may not present either rale or cough, yet that, on dissection, the finer bronchial ramifications may be found red, and filled with thick mucosities. But this latency of the disease is not constant, as the affection has been observed in children of but fifteen days old, with every symptom and physical sign of the inflammatory bronchitis in the adult. Under these circumstances, the disease may terminate by resolution, or produce death by asphyxia, and on dissection, the pathological appearances observed are similar to those found in the adult subject. The affection may also pass into the chronic form, and thus continue for an indefinite period, without apparent injury to the general health, while in other cases it lays the foundation of various pulmonary diseases.

As connected with the subject of infantile bronchitis, I may here allude to the researches of Dr. Joerg, of Leipsig, on a condition of the lung, which, according to him, may be induced by a too rapid or a too slow delivery. Under these circumstances a portion of the lung, more or less extensive, remains uninflated, the consequence of which is imperfect respiration, and the production of various pulmonary diseases. In a difficult delivery, he maintains, that the infant, from the compression of the brain, respires imperfectly, and consequently but partially expands its lungs; while in the too speedy delivery, in consequence of its short duration, and the inferior degree of compression of the placenta, he conceives that the foramen ovale is not closed, and hence that the necessity for respiration is diminished.

" Under the circumstances above mentioned," says Dr. Joerg, " we have often seen infants suddenly seized with illness, and sometimes die, in spite of every exertion made to save them, before the real cause of the attack, and the proper method of treatment, were discovered; and on examination the following appearances were observed, arising all from the same causes, though differing greatly among themselves in many respects.

" In every case in which we made a *post mortem* examination for several years past, a portion only of the lungs, from the greater half to merely an eighth or tenth part, was found filled with air, and of a red colour; while the remaining portion continued in the same state in which it had been in the fœtus, and was of a liver colour. When the infant had died soon after birth, the condensed portion was susceptible of inflation; but where death did not occur till several weeks after that event, it was found carnified and incapable of being inflated; sometimes the partition between the healthy and diseased portion was in a state of inflammation, and the latter contained vomicæ: the bronchi, too, were often inflamed and filled with mucus. The great contrast between the bright red of the healthy, and the liver brown of the diseased portions, struck the eye immediately on opening the thorax. In most cases, the foramen ovale was still open, and there were very firm polypi in the heart and large vessels. The brain was frequently gorged with blood, which was sometimes even effused between its membranes and over its surface: it also occasionally contained abscesses corresponding to others on the cranium, or fontanelle, that had been produced by the use of instruments, or by violent pressure against the pelvis during delivery. In the rest of the body, there was no particular morbid phenomenon constantly present: however, in the greater number of cases, the skin, particularly on the face, had a bluish cast; while in some it was withered and emaciated, and the whole body, especially the intestines, pale and bloodless.

"From these facts, and from observations made of late years during the progress of the disease, we are warranted in describing its nature and terminations in the following manner: The solidification, or continuation in the fœtal condition of a greater or less portion of the lungs, so that during inspiration their substance cannot be penetrated by the air. The blood, being still more incapable of penetrating, cannot be supplied with oxygen, and must consequently continue venous, and produce obstructions and dangerous congestions; while at the same time, from its being unable to afford the stimulus requisite to the system for the continuation of its functions, an atonic senile condition obtains, attended with the utmost weakness, and complete atrophy, and terminating in death in hectic fever. The general morbid condition is, consequently, difficulty of respiration and impeded circulation, producing dangerous and even fatal congestions. Its terminations are: 1st, recovery; 2d, secondary diseases; and 3d, death.

"I. *Recovery* ensues when the efforts of the infant to inspire are assisted by proper treatment, and the subsequent symptoms properly managed.

"II. *Secondary diseases*:—(*a*) obstruction of the lungs, inasmuch as a portion of them remains condensed, which, without actually producing death, is very oppressive and dangerous: (*b*) chronic cyanosis, the foramen ovale continuing open, and the infant being liable to constant suffering.

"III. *Death*:—(*a*) from apoplexy; in consequence of obstruction and congestion: (*b*) from suffocative catarrh, when the feeble respiration is not able to expel the mucus secreted in the bronchi, and the violent efforts at full inspiration produce bronchitis, and an over-abundant secretion of mucus, which the patient has not strength to get rid of: (*c*) from fever, the result of bronchitis: (*d*) from atrophy; the production of animal heat being prevented by the deficiency of oxygen, and the whole system paralyzed by the want of its requisite stimulus.

"SYMPTOMS.—When the infant comes into the world, the head is either found greatly swollen, (in which case abscesses often form in the part that has suffered from pressure, and inflammation or violent congestion of the brain ensues,) or else, though quite uninjured, and the delivery having been rapid and easy, it cries but feebly, breathes very short, and exerts the muscles of the thorax greatly; it is presently attacked with a faintness, and if it had been capable of drinking previously, now loses that power, the voice becomes hoarse and weak, and scarcely audible. Stertor and convulsions soon follow, the little patient becomes quite blue, the eye-balls turn, and the respiration remits, sometimes for so long as five minutes, till the scene at last closes with death. Should the illness continue for some days or weeks, a little short cough, the most certain sign of violent bronchitis, comes on; together with total weakness, atrophy, and hectic fever; and the child, at the very latest, four or five weeks after birth, sinks under a violent attack of cyanosis, or bronchitis, or from the effects of the fever and atrophy."

There can be no doubt that this non-expansion of the pulmonary cells must be a powerful exciting cause of congestive and of inflammatory diseases of the lung, as the natural proportions which should exist between the capacity of the lung and the circulating fluid, are thus destroyed; just as we observe in cases of the obliteration of one lung, that the opposite one may become ultimately congested and otherwise diseased. I think it not unlikely that the condition of the lung, as described by Dr. Joerg, is a frequent one, and, though it has never struck me to connect its existence with the exciting causes which he has described, yet I have observed it in several cases. In these instances one lobe, or a certain portion of it, was found in a non-crepitating state, of a yellowish colour, somewhat translucent and flabby, and without any appearance of inflammatory vascularity, or effusions of lymph on the pleura. In these cases the children died immediately after birth.

Thus we see, that a child may present the symptoms and signs of pulmonary irritation from the first moment of extra-uterine life, a condition traceable to one of two causes; first, the existence of an intra-uterine bronchitis, or pneumonia; and secondly, the non-expansion of a portion of the lung, as described by Dr. Joerg. In this way we may have an explanation of those cases in youth and adult age, in which we are informed that the patient has had a cough from the time he was born. Many of such cases terminate in dilatation of the air cells, and emphysema of the lung, and its train of miserable consequences.

But the infant, after birth, is subject to many varieties of bronchial inflammation. One of the simplest and mildest forms of this disease occurs about the period of the first dentition, and it seems likely that it is not then a primary disease, but rather the effect of the general constitutional disturbance, as we often observe it arising either along with, or subsequent to the irritation of the gums, and subsiding after the adoption of means calculated to relieve these parts.

Nor is bronchitis a constant attendant on dentition, for irritation may be localized in the abdomen, the head, or the skin, all which tends to show that the bronchial irritation is not the first link in the chain, and that its occurrence is accidental and secondary. That this doctrine is important in a practical point of view, no one can doubt; yet whether it may be shown that the bronchitis be the cause or the effect of the fever, the detection of its existence is of importance, and its removal absolutely necessary.

There is no difficulty in recognizing this affection, even though it should exist in an apyrexial form. Under such circumstances the child may be observed to be irritable, his breathing hurried, with a slight wheezing in the throat, and acceleration in the pulse. In more severe cases there is fever and cough, the nares dilate during inspiration, and the act of sucking seems to be performed with difficulty. If we examine the mouth, we often find it hot, and the gums dry and swollen, and one or two teeth may be observed coming forward. I have more than once found, that such an attack supervened in children who had had copious dribbling for a length of time previously, and that the arrest of this secretion preceded the bronchitis and constitutional disturbance.

In some cases the cough has a decidedly croupy character, although during the intervals the breathing, though hurried, is not at all stridulous. This character of cough is often a source of great alarm, and may lead to an unnecessary degree of activity in practice. The symptoms, such as have been described, continue from four to five days, and often subside rapidly on the appearance of a tooth, although they may be liable to return upon every new irritation of the gums.

We shall now proceed to examine the occurrence of bronchitis in the more advanced subject, and it must be admitted, that when we consider it in its various forms, whether of an idiopathic, a secondary, or a symptomatic affection, or as occurring complicated with many other diseases of the chest, we cannot help admitting it to be one of the most frequent, and often most fatal of diseases. In discussing this subject, I shall not describe the bronchitis of the advanced child separately from that of the adult, inasmuch as its signs, symptoms, and pathology are the same, but having examined into the nature and diagnosis of the idiopathic disease, I shall consider it in its secondary and symptomatic forms.

We may divide the cases of bronchitis into the examples of the primary, secondary, and complicated forms: the primary, those in which the first morbid influence seems to be exercised on the respiratory mucous membrane, and in which the fever, if it exists, may be considered as purely symptomatic: in the secondary, on the other hand, there has been a pre-existing disease elsewhere, which, in general terms, may be stated to be either the irritation of another organ, which acts by sympathy on the lung, or the existence of that general morbid state which has got the name of essential fever, and of which one of the most remarkable pathological characters is, the production of secondary diseases in the gastro-pulmonary mucous membrane, and also in the solid viscera themselves. Thus, in a typhoid fever we may have an affection of the bronchial mucous membrane, analogous to the secondary inflammation of the stomach and intestines: a disease which, although not the first cause of symptoms, exercises an important part in the progress, and is not unfrequently a cause of the fatal termination of the case. Lastly, by the complicated form we mean the bronchial inflammation which accompanies other diseases of the lung, such as pneumonia, pleurisy, pulmonary apoplexy, tubercle, cancer, &c.

This complication has been already stated to be exceedingly frequent and important, as yet, however, no certain relation, as to nature, extent, or intensity, has been established between it and the parenchymatous disease in different individuals, or even at different periods of the same case.

ACUTE PRIMARY BRONCHITIS.

This affection may be met with under various conditions. As a mild, and often apyrexial disease, in which the irritation seems to be consecutive to an affection of the lining membrane of the nares and throat, and so slight as to scarcely interfere with the healthy functions, it is not uncommon. In this case, secretion takes place at an early period, and is followed by relief. In fact, it seems to be to the respiratory, what the slight apyrexial diarrhœa is to the digestive system. It is scarcely necessary to remark, that the symptoms of cough, dyspnœa, and internal soreness, vary remarkably, according to the susceptibility of the individual affected; thus in a female, subject to hysterical or spasmodic diseases, a slight catarrh may produce the *tussis ferina*, while in another subject, who is predisposed to asthma, there may be severe dyspnœa from the same cause.

There is also the greatest variety with respect to the frequency and the character of the cough; some patients being harassed with continual paroxysms, while others enjoy long intervals of rest. In some cases, the exertion of the voice is most distressing, its sound is feeble, and the act of speaking is followed by dyspnœa. In other instances, on the contrary, speaking, unless when long continued, is productive of but little distress.

One of the most curious symptoms connected with this disease, and which is met with in other forms as well as that under consideration, is the tickling sensation perceived in the trachea, which commonly precedes, and seems to be the cause of cough, and which is referred either to the situation of the bifurcation of the trachea, or that portion of the windpipe immediately above it. This is often perceived on the patient's lying down, but may also occur when he is in the erect position, particularly in the morning, when it will continue for a considerable time, and cease only after a free expectoration. I am not aware that any author has investigated this curious symptom, except Dr. Graves, who has alluded to it in one of his published clinical lectures, and has suggested it as an interesting subject for inquiry. He observes, that the sensation of tickling or itching seems to be almost exclusively confined to the skin, where it appears to be dependent on slight causes, apparently incapable of producing that modification of nervous sensation termed pain. In other cases, as the same author remarks, it seems to be connected with the rise and decline of inflammatory action, and it does not appear to affect the mucous tissue, except in a slight degree, and under peculiar circumstances, and the only liable part of the pulmonary mucous membrane seems to be that of the trachea already referred to.

In speaking of the symptom of cough, when the patient assumes the recumbent position, Dr. Graves suggests that this may depend on the fluid secreted by the mucous membrane passing over that part of the trachea where the tickling sensation is felt, the flow of mucus to this part being favoured by the recumbent position; and I have little doubt, that although the symptom of cough coming on, on the patient's lying down, may proceed from other causes besides this, yet that the above explanation is applicable in a considerable number of cases. I may observe here, that among the known causes for this symptom, one the most remarkable is the extreme elongation of the uvula, and next to this is the existence of suppurating cavities, which communicate freely with either bronchus. Between these two cases we observe the following remarkable rence, namely, that when the symptom proceeds from an ated uvula its severity is unaffected by the position of the patient on either side, while in the case of a suppurating cavity, the cough is often worse when the patient lies on the healthy side, a symptom easily understood, when we reflect that this position is the most favourable for the direct passage of the purulent secretion into the bronchial tubes and trachea.

From a consideration of the symptoms and the stethoscopic phenomena in this disease, it seems highly probable, that in the majority of cases, the smaller bronchial ramifications are unaffected. We find that fever is either absent or extremely slight, and that unless with a complication of decided spasm of the lung, we have never any perceptible degree of lividity of the countenance. Further, we almost never observe the occurrence of dropsical effusions, a circumstance which, as far as it goes, points out that no notable obstruction to the pulmonary circulation has occurred. With respect to the stethoscopic phenomena, we shall describe them presently, and here only observe that they strengthen the above opinion.

But in the more severe form of the disease, we find all the foregoing symptoms greatly aggravated; there may be high fever, with remarkable exacerbations, severe dyspnœa, and difficult expectoration, the mucus being sometimes tinged with blood. It is in this affection that lividity of the face is principally observed, a proof of the imperfect arterialization of the blood.* Cerebral and abdominal congestions may also occur, as has been remarked by Laennec, and dropsical swellings are a frequent result. The disease may pass into congestion and inflammation of the substance of the lung, and in many cases stitches are felt in the sides, which there is every reason to believe, proceed from the occurrence of pleuritis, generally of the dry form, but leaving adhesions more or less extensive according to the violence of the disease.

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* I have long observed that lividity is much more an attendant on severe bronchitis than on pneumonia with hepatization, or even pleurisy with copious effusion. This I do not put forward as a novel observation, but may remark that it strengthens the opinion, that the aerating power resides more in the bronchial ramifications than in the air cells.

This acute stage having continued for a period, the duration of which is extremely variable according to circumstances, the second stage sets in, which is characterized by a change in the nature of the fever; the inflammatory passing more into the hectic type; the countenance becoming pale and shrunken, and the pulse feeble and often rapid. The patient perspires, and a sour smell may be perceived from the surface; the cough continues frequent though less distressing, and is followed by copious expectoration of concocted mucus or muco-purulent matter, and the breathing, though hurried, is generally less laborious than in the acute stage. The patient emaciates, and to a person unacquainted with the history of the case, would seem in an advanced stage of suppurative phthisis. There can be no doubt that the recovery of an individual, under these circumstances, has been in many cases described as an example of the cure of phthisis, and particularly in those cases where the expectoration was copious and muco-puriform.

On the subject of the expectoration in acute bronchitis I shall be brief. In the earlier forms the secretion is scanty, and consisting of a clear gelatinous mucus, combined with a frothy serum; according as the disease advances this secretion becomes more opaque, more abundant, and less tenacious; and at that period when the inflammatory fever ceases, and is either succeeded by an apyrexial state, or by a hectic condition, we observe a remarkable change in its character. It becomes thick and has considerable consistence, or it may pass into the muco-puriform character, when we observe it in masses of a greenish yellow colour, quite opaque, and though somewhat viscid, yet flowing together.

But although in its milder forms the primary bronchitis is a common affection, yet the more violent attacks of the disease are far from being frequent, at least in those of mature age; for in the great majority of the cases of acute bronchitis which come before us, we see it either as supervening on some chronic affection of the lung, or as a secondary disease, such as that which arises in the course of the eruptive and continued fevers. Indeed the more violent primary bronchitis, though common in the child, is a rare disease in the adult, while with respect to the chronic forms of the affection, the reverse seems to be true, as this latter is common in the adult, and comparatively rare in the child.

This disease may terminate by resolution, it may pass into a chronic and increasing flux from the bronchial membrane, with or without hectic, giving rise to various alterations of the lung; it may cause death by a sudden obstruction of a large tube; it may be accompanied by a rapid, or followed by a slow development of tubercle; it may pass into pneumonia, or terminate fatally by an excessive secretion into the bronchial tubes, or by hydrothorax.

CHRONIC PRIMARY BRONCHITIS.

It is not easy to draw the line of distinction between this affection and the second stage of the last variety, as we may observe it either as its continuation, with certain modifications, or as an affection in which there never have been the precursory inflammatory symptoms. We may get a good idea of the ordinary form of this disease by considering it as a species of gleet of the mucous membrane, in which the inflammatory irritation, if it exists, is in many cases not so severe as to act sympathetically on the system; so that patients under these circumstances, although labouring under cough and expectoration, may yet preserve a good state of general health.—Nutrition may go on well; there may be no fever whatever, and even but little dyspnœa, unless upon considerable muscular exertion. In such cases, there is generally a more or less complete remission of the symptoms during the summer season, but when winter approaches, the cough and expectoration become more troublesome, again to subside on the approach of summer. Thus may these patients continue for years, when the duration of the remissions becomes less, their completeness diminishes, and a permanent irritation and flux are established. This may have various terminations, giving rise in one patient to dilatation of the tubes, in another to Laennec's emphysema, and in a third, to the complication of these affections with phthisis, morbus cordis, hydrothorax, or general dropsy. The sufferings of these patients vary according to the degree of nervous susceptibility of the lung, as we observe that in some, asthmatic symptoms may be established, while in others, the disease never assumes this character.

Where the flux becomes very considerable, there is often a great degree of emaciation, yet in such cases I have remarked, that the circulating and digestive systems often continue in a singularly healthy state, a circumstance which, as far as it goes, is of importance in the diagnosis between this affection and tubercular phthisis. I have already stated that in certain cases a chronic bronchitis becomes complicated with tubercular disease of the lung, and my experience leads me to conclude that this occurrence is much more frequent than has been hitherto supposed. In describing phthisis, I shall return to this subject, and here only remark, that as far as I have seen, this result of bronchitis is more common in individuals who have passed the meridian of life, and although the transition from the state of mere bronchitis into that of the tubercular complication is commonly slow and indistinct, yet that it is pointed out by a general, though gradual failure of the vital powers, by the pulse becoming accelerated, and by a slow, though decided, emaciation of the patient. Under these circumstances, a careful physical examination will often enable us to detect some degree of solidity in the upper portion of one lung, advancing slowly, and ultimately, though almost always at a remote period, being succeeded by the signs of ulceration of the lung.

This most unfavorable change in the symptoms and signs, I have seen to supervene at so late a period as four years after the first invasion of the bronchitis. The patients appeared to re- st the tubercular development for a great length of time, and then, in some cases, without any obvious exciting cause, and apparently from the constitution giving way, and in others, after some access of local irritation or general disease, did this fatal complication become slowly but decidedly manifest.

The characters of the expectorated matter in bronchitis are so varied, that to give any description of them, which would be at the same time clear and succinct, is indeed extremely difficult. But the subject is one of great importance, for we shall find it to be connected with many points in the history, prognosis, and treatment, not only of the disease in question, but of most other pulmonary affections.

We are as yet ignorant of the pathological laws which regulate the various lesions of secretion in different diseases, or in different individuals apparently labouring under the same disease; and of the reasons why the bronchial membrane, varying in its products like other tissues, at one time pours out a serous, at another a mucous, and at a third a purulent fluid, we know nothing. But still, by observing the actual condition of the secretion in relation to the symptoms, and studying its changes in connexion with the history of the case, we may, and often do, arrive at most important practical results.

The secretion from the bronchial mucous membrane may be modified in quantity and in quality, and the extent and number of these modifications are infinitely numerous. As we cannot describe even the principal modifications in connexion with any *certain* condition of the lung, I shall content myself with enumerating the varieties of secretion which are most commonly observed, and shall make a few comments upon each.

We may divide the secretions from the bronchial mucous membrane, when in a state of irritation, as follows:

First.—Transparent mucous secretions.

Second.—Opaque mucous, or albuminous secretions.

a.—Amorphous.

b.—Moulded to the form of the tubes.
Third.—Muco-puriform secretions.
Fourth.—Puriform secretions.
Fifth.—Serous secretions.

Transparent mucous Secretions.

We meet with this form of secretion most commonly in the earlier stages of acute bronchitis, when, however, we find that previous to its appearance there has been either a dry cough, or a cough with expectoration of a serous fluid. There is considerable variety in the quantity of this secretion formed in different cases, as also in its tenacity, which latter character has been considered as a measure of the violence of the irritation.

But transparent and adhesive mucus may be formed in other cases of bronchitis. Thus, in some violent cases, long after the expectoration has become muco-puriform, we may observe, as it were, a return of the secretion to its original form. It loses its diffluent character, and its opacity, and its expulsion becomes difficult. This unfavourable change, which is generally accompanied by constitutional disturbance, may subside in a few hours, and reappear many times in the course of a single case. Under these circumstances we shall often observe a corresponding change in the stethoscopic phenomena, to which I shall presently allude. In cases too of ordinary chronic and apyrexial bronchitis, we find that a new attack of bronchial inflammation may altogether arrest the secretion, or change it from the opaque and diffluent to the transparent and viscid character. On the subsidence of the irritation, however, the former character of the secretion returns.

From a consideration of these facts, we cannot help in some way connecting the occurrence of this transparent and viscid secretion with a condition of irritation in which the morbid action is not relieved by the secretion. We find that the sooner the opaque sputa appear, the sooner shall we observe the convalescence of the patient; and that in those cases where this salutary change is delayed, the sufferings and danger are proportionally increased. How commonly do we observe this in phthisis, in which the bronchial irritation seems to continue in its first stage for an indefinite length of time, and in which there is every indication of a local but unrelaxed irritation of the lung; and in the cases of Laennec's emphysema we may see other instances of a bronchial disease which has not been relieved by the more elaborated secretion, and which consequently has continued so as to disorganize the lung.

Opaque mucous or albuminous Secretions.

In the characters of this class we do not find much variety, and the circumstances attendant on their appearance are, in general, constant. In almost all cases where these sputa are met, there has been a preceding stage, in which other characters occurred, and in which there was the formation of the transparent secretion, occurring with or without a symptomatic fever.

In commenting on this kind of expectoration I shall first notice the amorphous variety, and next that in which the secreted matter adapts itself to the form of the bronchial tubes, so as to produce, as it were, casts of the air passages.

In their ordinary form we find these sputa to consist of shapeless masses of a dull white colour, with a slight yellow tinge. These masses may be expectorated with scarcely any accompanying serous fluid, when they unite, more or less, so as to form a semi-fluid, adhesive mass. In other cases, however, a considerable quantity of serous fluid is expelled along with them, when we observe them more frothy, and presenting the appearance of rounded sputa, floating in a nearly transparent fluid, of much less tenacity, and containing a few albuminous striæ, not unlike fragments of vermicelli.

Lastly, there are cases of chronic bronchitis, in which we observe the expectoration of a vast quantity of opaque albuminous matter, of a whitish colour, and without any tendency to a purulent character. In such cases, when the containing vessel is inverted, we see its contents slowly evacuated in one elongated homogeneous mass, on the surface of which more or less of a frothy serum may be observed. Such cases are generally of extreme chronicity, and present the signs of chronic bronchitis, with dilatation of the tubes, or even the air cells of the lung.

We shall next consider that form of secretion in which the secreted matter is moulded to the form of the bronchial tube, and acquires a certain degree of consistence.

Although our knowledge on this subject is as yet but limited, it may be stated, that this formation of inspissated mucus, or of a substance approaching to lymph, may be found either as a very circumscribed or a more general lesion. In the first of these a plug is formed, which by obstructing one of the larger tubes, may bring on a violent dyspnœa, and be even a cause of death; while in the second, cylinders of this substance, corresponding to the form of the bronchial tree, are found to follow its ramifications most extensively, and to be continuous, as Reynaud has shewn, nearly as far as it was possible to trace the bronchial tube. Under these circumstances the patient may expel casts of the air passages after violent fits of coughing, several cases of which are on record.

It is not easy to explain the occurrence of this unusual symptom; and indeed we are still in want of facts to throw light on the subject. Why this plastic disposition is acquired by mucous membranes, in certain cases, while it seems denied to them in others, is still a matter of speculation, and the subject could scarcely be discussed here with propriety. When speaking of croup, however, I shall return to it.

In a case which I lately saw along with Dr. Marsh, this curious symptom was present. The patient, a middle aged female, had suffered from a chronic affection of the chest, and had lately become liable to this form of expectoration. The casts expectorated were several inches in length, and seemed to have occupied the bronchial tubes from about their third order to nearly their finest ramifications. They were white, cylindrical, and not hollow; but between their exterior surfaces and centres there was a remarkable difference, the former being much more consistent and opaque, while the latter seemed formed of a soft and transparent mucus, with comparatively little tenacity. This conformation gave them, at first sight, the appearance of tubes. In the centre of many of them we observed small chains of air bubbles, a circumstance to be expected from the fact, that their expulsion was extremely difficult, and accompanied by violent cough.

The form of these concretions was exactly similar to those of which a plate is given in Dr. Baillie's Morbid Anatomy. Their consistence was by no means so firm as what we observe in cases of true croup. They seemed to have been originally formed as a tremulous mucus, which had filled the tubes, and from some cause had remained there a long time, until their outer surface had become opaque and more consistent; apparently from that process, by which we see the more fluid parts of secretions absorbed, and their remaining constituents consolidated.

In another case I have witnessed the expulsion of a cylinder of an albuminous substance, nearly three inches in length. This was expelled after a violent and long continued fit of coughing.

The science has been lately enriched by a most important memoir on this subject, from the pen of M. Reynaud, a memoir, the value of which can be scarcely estimated. From the researches of this eminent pathologist, it appears that a species of plastic inflammation of the minute bronchia is much more frequent than has been hitherto supposed; and that it occurs in many cases of phthisis, and of what has been called pneumonia. Without directly asserting that as we approach the bronchial cells, the character of the lining membrane changes from that of a vascular mucous membrane, endowed with villosities and follicles, to a condition very analogous to that of a serous membrane; he yet clearly inclines to this opinion, which has been long entertained in the school of Dublin, and he founds on it an explanation of the plastic or adhesive inflammation of the minute tubes.

When I come to consider the consequences of inflammation on the air tubes, I shall avail myself of these beautiful researches, and here only remark, with reference to our original subject, that if this semi-plastic expectoration have any value in diagnosis, it is that it seems connected, if not with actual tubercle in the lung, at least with a decided tendency to that lesion. It apparently indicates a lymphatic constitution of the lung; a state in which the white tissues are predominant, and where of course the liability to the "*formative inflammations*" is more developed. In the first case to which I have alluded, decided physical signs of tubercle existed; and in the second, the case was one of manifest suppurative phthisis, and the diagnosis was verified by dissection. Laennec describes a concretion found in a phthisical subject, and the same has been observed by other authors. But further observations are necessary on this interesting point.

Muco-puriform, and puriform Secretions.

I shall consider these forms of expectoration together; and in the first place observe, that while, in bronchitis, the expectoration of muco-puriform matter is common, yet that of unmixed pus seems to be very rare. An absolutely puriform expectoration is an unusual circumstance in any of the pulmonary diseases, even in those in which ulcerative or suppurative action has taken place. It is occasionally met with in the advanced stages of phthisis and pneumonia, but is more often absent, and in bronchitis is rarely seen indeed. I do not deny the important fact, that the bronchial mucous membrane is capable of secreting pus, independent of any ulceration of the lung; but all that I wish to observe is, that when, with respect to frequency, we compare the muco-puriform with the puriform expectorations, we find the first by far the most common.

The muco-puriform expectoration is more commonly met with in the second stage of acute than in the chronic bronchitis. The disease, too, has commonly occupied the smaller tubes, so as to produce its muco-crepitating rale; and the appearance of the purulent secretion marks the passage from the first into the second stage of the disease. I may here remark, that even in a violent case of bronchitis we may, by active treatment, so modify the inflammation, that the secretion of pus scarcely occurs, we having, as it were, cut short the disease in its first or mucous stage. But this unfortunately is rare, and an abundant secretion of muco-purulent matter is a common sequence to the first stage. If the disease, in its earlier periods, has been neglected, or if discovered, yet has been treated with timidity, the muco-purulent secretion in the advanced stages will be abundant, and may prove the cause of a mechanical death. I have seen several cases of intense general bronchitis, in which the early treatment had been injudicious. The antiphlogistic means had been insufficient, and were combined with, or too soon changed for, the exhibition of stimulants. In these cases the patients had a long and dangerous struggle, with alternations of inflammatory fever, and a collapsed state; with viscid expectoration at one time, and profuse muco-purulent discharges at another; and with the stethoscopic signs of a state of the lung, not far removed from the third stage of pneumonia.

In order that the change from the mucous to the muco-puriform secretion be considered a favourable indication, it is necessary that certain circumstances shall attend it. These I have observed to be, the expectoration becoming easier, the pulse softer and slower, the breathing easier, and the fever diminishing. With respect to the physical signs, we find the muco-crepitating rale becoming larger, the respiration returning from above downwards, the action of the heart quiet, and the sound on percussion clear, even in the postero-inferior portions of the lung.

But in other cases the reverse of all this is observed; and we have the combination of a muco-purulent expectoration with the symptoms and signs of intense irritation of the lung. To this case I have just now alluded.

In a practical point of view, the great value of the symptoms of the change of character of the expectoration is, that it is an index pointing out the time for a change in treatment, of a passage from an antiphlogistic to a stimulating medication. Taken alone, however, it is insufficient; it must be accompanied by the favourable symptoms and signs, and we may have a case in which, long after the appearance of muco-purulent secretion, it will be right to suspend the stimulating, and resume the antiphlogistic system.

Before concluding this part of the subject it is right to allude to the occasional fœtor of the muco-purulent, or purulent expectoration, in chronic bronchitis. As I have seen but a single case of this, I shall content myself with referring to the writings of Andral and Laennec on the subject.

Serous Secretions.

We meet with this form of expectoration in a great number of cases of bronchitis and phthisis, even where other, and very different secretions, are taking place from the lung. We may observe it in the earlier stages of bronchial inflammation, before much mucus has been formed, and we may see it again in the advanced stages, when an opaque mucous or muco-purulent matter is abundantly secreted; lastly, it occurs as the principal secretion, as is seen in many cases of *humid asthma*, and then may be formed in great quantity indeed. Under these circumstances we may have a sudden congestion of the lung, terminating in a copious flux into the bronchial tubes, or may observe a continual and copious expectoration of a serous or sero-mucous fluid, for a considerable period of time. It is stated by Andral, that patients labouring under this affection ultimately resemble individuals who have suffered from great losses of blood. They become emaciated; there is some swelling of the face, and a general aspect which is truly anemic. The other perspiratory secretions seem nearly suppressed, and the functions of the stomach are languid. The same author relates a case in which a sudden and most copious secretion of serous fluid from the lung coincided with the disappearance of an hydrothorax.

Laennec, in his division of bronchitis, has described a pituitous catarrh, in which the discharge of great quantities of sero-mucous fluid from the lungs may occur as an acute or chronic disease. Thus he states, that in the course of one or two hours, from two to three pounds of fluid have been discharged.

I have seen but few cases analogous to Laennec's idiopathic pituitous catarrh. Indeed in almost all the cases of this kind of expectoration which I have witnessed, there was also a discharge either of concocted mucus, which was the most common complication; or of muco-puriform or puriform matters, which were observed in cases of phthisis, particularly where the patient had passed the meridian of life, and had been long affected with the disease. I have not had an opportunity of connecting it with the simultaneous development and persistence of miliary tubercles in the lung, as remarked by Bayle and Laennec. The disease, as Laennec mentions, commonly terminates by œdema of the lung, which may continue for a considerable period of time, ultimately, however, ending in inability to expectorate, and asphyxia.

Physical Signs of Bronchitis.—Before proceeding to consider the other forms of bronchial irritation, I shall examine the physical signs of the primary bronchitis, in its acute and chronic forms, in the following order:

First.—The results of percussion.

Second.—Signs discoverable by the sense of touch.

Third.—Signs discoverable by auscultation.

With respect to the first of these classes, it is to be remarked that there is no direct sign derivable from percussion, the sound being almost always of natural clearness. The principle already laid down should be recollected, that other things being equal, the sound on percussion is directly as the quantity of air contained within the thorax. Now although the vascularity and turgescence of the inflamed mucous membrane must, to a certain degree, diminish the æriform contents, yet we find that this diminution is not sufficient for the production of sensible dulness, and hence the sound on percussion in bronchitis, whether acute or chronic, is almost always clear. It is probable that if our organs of hearing were endowed with greater delicacy, a certain shade of difference could be detected, but in their actual condition, we cannot in most cases distinguish any variation from the healthy sound of the chest. In fact there is but a single case in which simple bronchitis is ever accompanied with decided dulness, namely, that in which a vast secretion of mucus or muco-purulent fluid exists in the bronchial tubes; but such a case is extremely rare, for a large proportion of the bronchial tubes may contain quantities of secretion, and yet the sound on percussion shall continue without any perceptible diminution. When, however, the disease is combined with affections which have their seat in the areolar structure of the lung, such as œdema, congestion, pneumonia, or tubercle, the results are of course different, the amount and situation of dulness varying according to circumstances.

It would be an interesting question, as connected with the want of dulness in bronchitis, to determine whether, pending the turgescence of the bronchial membrane, some degree of dilatation of the air cells may not exist, so that the air thus accumulated might compensate for that which has been displaced by the state of the mucous tissue. Could we thus account for the clearness on percussion, notwithstanding an extensive congestion of the minuter tubes?

Yet though percussion gives no direct result in bronchitis, its employment is of importance in the particular diagnosis. Thus, suppose that after the existence for three or four days, of fever, cough, hurried and difficult breathing, the chest still sounds well, the great probability is that the disease is bronchitis. The patient has had an acute inflammatory affection of the lung, and but of a few days' standing: this must be either bronchitis, disease of the serous membrane, or of the parenchymatous tissue itself. Here the absence of dulness is of the greatest importance; for were it a case of pleuritic effusion, or of disease of the substance of the lung, the great probability is, that by this time a degree of dulness would be manifested; in the one case the lung would be compressed, and its place occupied by a liquid effusion; in another, more or less obliteration of the air cells would take place, from congestion, or from inflammation. *The absence then of dulness, with the existence of acute irritation of the lung, which has continued for several days, forms an important argument that the case is one of uncomplicated bronchitis.*

But the knowledge of the absence of dulness in mere bronchitis may be advantageously applied in general diagnosis. The study of symptoms, independent of physical phenomena, will not be sufficient to establish the diagnosis of simple bronchitis, for there are a vast number of examples of disease of different kinds, in which the symptoms are only those of bronchitis, or at least might be referred to this lesion. But as we have before said, if we find, on the examination of any particular case of this kind, a dulness on percussion, either of one portion of the chest as compared with the other, or of the whole chest as compared with its sound at some former period, we may be certain that something more than mere bronchitis exists. It may be said that a copious effusion of mucus into the tubes will give a dulness of sound, but I can say, from an extensive experience, that this only occurs in the most extreme case, and in the last stages of the disease; for I have met with cases where the bronchial system was extensively filled with muco-purulent matter, yet in which the sound was generally clear. There is, however, one case in which dulness may be observed, namely, great dilatation of the bronchial tubes, with compression of the intermediate pulmonary substance: to this we shall hereafter allude, when describing the disease in question.

From the knowledge of the fact, that in simple bronchitis there is nothing to produce a perceptible dulness of sound, we derive a most important assistance in the diagnosis of tubercular development, whether in the acute or chronic form. The value of this will be seen when we consider the frequent similarity of symptoms between the diseases of tubercular phthisis and bronchitis, a similarity easily understood, when we recollect that in most cases of tubercular development there is a co-existing catarrh: but as I shall show hereafter, the occurrence of a partial, or general and progressive dulness, in a case presenting the symptoms of bronchial inflammation, is one of the principal circumstances on which the diagnosis of tubercle depends.

Finally, it is plain, that the longer the symptoms of catarrhal inflammation have existed, without the occurrence of either partial or general dulness, the greater will be the probability that the case is an example of uncomplicated bronchitis. There is a sign discoverable by percussion in cases of bronchitis, particularly in the young subject, which has not been sufficiently noticed; I allude to a metallic resonance, somewhat analogous to the cracked jar sound of cavities, but evidently more diffused. The history of the case, the extent of the phenomenon, the absence of dulness, and of the stethoscopic signs of a cavity, will be sufficient to distinguish it from the above sign.

With respect to the signs discoverable by the sense of touch, there is not much to be said. In a great number of cases, and particularly after the disease has passed its first stage, a distinct vibratory sensation is perceptible when the hand is laid on the thoracic integuments. This can be detected both during inspiration and expiration, but is generally more distinct in the former than in the latter. It is more evident in the child and the female than in the adult male, although it is not unfrequently present even in the latter case. It seems to be more an indication of a free secretion into the larger than the more minute tubes, for it will frequently disappear after a cough with expectoration, again to return when the secreted matter accumulates, and if while it is present we apply the ear, the loud sonoro-mucous rattle is always perceptible; in some cases, however, on making the patient draw a deep breath, the vibration is decidedly increased. This vibration is much more distinct in the middle and inferior than in the upper portions of the lung: and is not met with in simple pleurisy or pneumonia, although in the former disease a phenomenon may occur which might possibly be confounded with it; I allude to the sensation of rubbing (frottement) which occurs in certain stages of the dry pleuritis, and which, like the vibration of bronchitis, is in accordance with the motions of respiration. But a little practice will enable us easily to distinguish them; the bronchial vibration giving the idea of air passing in many directions through an adhesive fluid, while the rubbing sensation of pleurisy is that of two continuous, though roughened surfaces, moving one upon the other; lastly, a momentary application of the stethoscope will often determine the point, for in the majority of cases of pleuritic friction, the respiratory murmur may be heard without any admixture of rale.

In considering the signs referrible to the passage of air during the acts of respiration, we find that several causes exist for the modification of the respiratory murmur; these may be enumerated as follows:

First.—The turgescence of the mucous membrane, a cause which principally affects the phenomena of the smaller tubes and air cells.

Second.—The existence of an anormal secretion into the cavity of the tube itself; and

Third.—The existence of spasm; the amount of which is exceedingly variable in different individuals. All these unite in forming the numerous varieties and combinations of Laennec's *sonorous, sibilous*, and *mucous rales.*

In the occurrence and combination of these phenomena there are the greatest possible differences in different cases, but as a general rule it may be stated, that the modifications of sound connected with turgescence of the mucous membrane and spasm, are to be found principally in the first or dry stage, while those produced by the passage of air through fluid in the tubes, are most evident in the second or secretive stage, although even at this period the cooing and sibilous sounds may exist, though combined with a mucous rattle. In some cases the phenomena are universal, and so intense as almost completely to obscure the natural sound of respiration, while in others they may be partial, and only now and then perceptible, and even degenerate into a character of respiration, which can only be appreciated by actual observation, but in which it may be stated that the respiratory murmur differs from its healthy character, in having a certain roughness. I may observe, however, that the case in which this last character is most often perceptible is that of pneumonia, for some time after resolution has taken place; a state in which there is every reason to believe that the bronchial mucous membrane still labours under a certain degree of irritation.

As a general rule it may be stated, that in the acute stage, during ordinary respiration, the louder and more intense the rales are, the more severe is the disease. But to this rule there is one remarkable and important exception, which I first observed in bad catarrhal fevers. In such cases, during ordinary respiration, we may hear little or no rale, and yet the disease be in such a state of violence as to threaten the life of the patient. The reason of this seems to be, that the finer ramifications of the bronchial tubes are so turgid, as that, during ordinary respiration, the air does not enter them with sufficient force to produce a tone. But if, under such circumstances, we make the patient take a forced inspiration, we are astonished at the intensity, number, and variety of the sounds produced. Now, in such cases it commonly happens, that as the patient gets better, the rale, during ordinary respiration, becomes distinct and constant, so that here an increase of rale during ordinary breathing points out a decrease of disease.

In some cases of chronic bronchitis, and particularly in those where a muco-purulent secretion exists, we may hear nothing but a mucous rattle of various degrees of intensity and extent. In most instances the bubbles are large; but they may be so small as to produce a rale which is almost crepitating. Such cases are not uncommon; and as I have known them, in some instances, to be confounded with phthisis, I shall dwell shortly on their diagnosis. In both diseases a muco-crepitating rale, of great extent and intensity, may occur, but by attending to certain circumstances, the chances of error will be much diminished. The first, and most important, is the result of percussion. I have already stated that we may have a great amount of bronchitis without perceptible dulness of sound, while in cases of phthisis, so circumstanced as to give an extensive muco-crepitating rale, *there is in all cases decided dulness, either general or partial.* In some cases, which were supposed to be phthisis, I have, from the generally equable and persistent clearness of sound, decided that nothing but bronchitis existed, a conclusion which the perfect recovery of some patients, and the *post mortem* examination of others, fully verified.

Again, we may observe in both diseases, that a partial dulness is to be met with; but in phthisis, even where the whole lung is tubercular, this is almost always greatest in the upper parts of the lung, while in the case of bronchitis the reverse occurs; the dulness, where it does exist, being generally in the inferior lobes. This seems to arise from the accumulation of mucus in the more depending portions; and in many cases perience, that this only occurs in the most extreme case, and in the last stages of the disease; for I have met with cases where the bronchial system was extensively filled with muco-purulent matter, yet in which the sound was generally clear. There is, however, one case in which dulness may be observed, namely, great dilatation of the bronchial tubes, with compression of the intermediate pulmonary substance: to this we shall hereafter allude, when describing the disease in question.

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The same remarks apply to the occurrence of puerile respiration, which may be observed in both affections. In bronchitis, when it does occur, (and it is here much rarer than in phthisis,) it is principally found in the upper portions of the chest, while the reverse is almost always the case in phthisis. Other points of distinction might be described, but they will be better examined when we treat of the diagnosis of phthisis.

I have already alluded to the kind of exacerbation so likely to occur in certain cases of intense bronchitis, when the opaque muco-puriform expectoration changes its character, and becomes transparent and viscid. Now this change is generally accompanied by corresponding stethoscopic phenomena. The muco-crepitating rale becomes smaller, sharper, and the extinction of the respiratory murmur is more complete, so that there is a close approximation to the phenomena of pneumonia in its permeable stages. The clearness, however, of the sound on percussion, and the want of the bronchial respiration, so common, and so remarkable in the third stage of pneumonia, are differences of great importance; and in most cases, even on our first seeing the patient, will prevent us from forming an erroneous judgment of the case.

Before concluding my remarks on the diagnosis, from the secretion into the tubes, I may state, that I have observed a distinct agitation of the muco-purulent secretion in the tubes from the action of the heart. This was most evident in a case of intense bronchitis of the left lung, when the heart was acting strongly. Each pulsation caused a corresponding sound, or rale, continuing when the patient held his breath, and forming with the respiratory phenomena a distinct rhythm in the succession of sounds. This phenomenon is obviously analogous to that produced in a cavity by the action of the heart, or to the cardiac friction sound of dry pleurisy.

We now come to another physical sign in cases of bronchitis, namely, the complete suspension of any sound of respiration in certain parts of the lung. In most cases this phenomenon is but temporary, but it may be permanent. In the first instance, it will often disappear after a fit of coughing, a circumstance which led Laennec to believe that it depended on a temporary obstruction by mucus; but it is possible that spasm may have some effect in producing it, as a similar phenomenon has been observed in cases of hysteria. This is rare in ordinary bronchitis.

But Andral and Reynaud have shown that in consequence of a hypertrophy of the bronchial mucous membrane, the sound of respiration may be remarkably modified in the affected portion of the lung. This modification may vary from a slight comparative feebleness, to an almost complete absence of the respiratory murmur. Of the latter circumstance, the following case is an instructive instance: A patient, aged 31, entered the hospital of La Charité, presenting the symptoms of an organic affection of the heart. The respiration was heard posteriorly, and over the anterior surface of the left lung, with considerable intensity, and a mixture of mucous rale; while under the right clavicle it was extremely feeble, the sound on percussion being generally equal. The patient stated, that for a length of time he had felt a constriction a little above the right breast, and that, to use his own expression, he did not breathe with the right side of his chest. From the stethoscopic phenomena, it was supposed that emphysema of the superior lobe of the right lung existed. The patient died in a little more than a month, with the signs and symptoms of hydrothorax. On dissection, the upper lobe of the right lung presented no trace of emphysema; its tissue appearing healthy, though but little crepitating. At a few lines from the origin of the principal bronchus of this lobe, a constriction, so great as to scarcely admit the passage of a probe, was discovered, beyond which the calibre of the tube became again of its natural diameter. This partial thickening was owing to a hypertrophy of the mucous membrane, as the subjacent fibrous tissue was found natural; the remaining tubes in this lobe presented their natural calibre.

Here we find that the pathological appearances were in exact accordance with the signs observed during life; no cause existed to produce any dulness of sound, and accordingly this phenomenon was wanting, and the diminution of the respiratory murmur was clearly accounted for by the constriction of the bronchus. But, as Andral remarks, the phenomenon cannot be considered as a pathognomonic sign, inasmuch, as it may proceed from other causes. It may be produced, as I have seen, by a localized dilatation of the cells. Other causes for the production of comparative feebleness of respiration, with equality of sound on percussion, may be enumerated, but as far as I know, in all these, the feebleness of respiration in one lung has been general, differing in this from the case mentioned. Thus, either bronchus may be compressed by melanotic tumours, tuberculous ganglia, or aneurisms of the aorta, and lastly, the existence of a foreign body within the tube may produce the phenomenon in question.

In other cases this narrowing of the bronchial tubes is more general, but as yet no pathognomonic stethoscopic sign has been observed. In a case of this description, given by Andral, the respiratory murmur was not diminished, though a loud rhonchus was audible in the affected lung.

But this difference of respiratory murmur with equality of sound on percussion of both sides, may proceed from obstruction by the secretions of the tube itself. Of this, two remarkable examples are given by Andral. In the first case the patient, who had laboured for some time under the symptoms and signs of bronchitis with mucous secretion, was suddenly seized, during a violent fit of coughing, with extreme difficulty of breathing, which continued during the whole of that day and the following night; on being seen the next morning, he seemed on the point of death from suffocation. On percussion, the chest sounded every where clear, with puerile respiration over the whole of the left lung, and the postero-inferior portion of the right; but on this side anteriorly, and in the sub-spinous fossa, neither respiration nor rale was audible. He shortly after expired, and on dissection, the bronchus leading to the upper lobe was found completely obstructed by a mass of concrete mucus, which thus prevented the entrance of air into that portion of the lung, and afforded a satisfactory explanation of all the phenomena.

Here, as Andral remarks, the obstruction of a certain portion of the lung caused a sudden and fatal dyspnœa, which is the more remarkable, that in many patients, after a large portion of both lungs has become impermeable, life may be continued for a length of time, even without much dyspnœa. This apparent difficulty is explained by recollecting, that in these latter cases the permeability of the lungs has been gradually diminished; while in the above case the obstruction was sudden. To this point I shall return hereafter.

The second case was also one of chronic catarrh, with abundant puriform expectoration, but in which there was but little dyspnœa until the very last day of existence. This patient had been frequently examined, and presented an equable respiration, with the different varieties of bronchial rales. In the course of a night, after a violent fit of coughing, the respiration became suddenly and violently oppressed, and on the next day no murmur of respiration could be heard in the upper lobe of the right lung; the parts still sounding clear on percussion. The patient died on the following night, and on dissection, the principal bronchus of the superior lobe was found completely obstructed by a polypiform mucous concretion, which extended into several other bronchial ramifications of this lobe. On these cases the author makes the following observations: "The attention being directed to the case just described, the diagnosis should not seem difficult. We should be led to suspect obstruction of one bronchus, if, on a simple bronchitis, a severe dyspnœa suddenly supervenes, and if, at the same time, respiration ceases to be heard over a certain extent of lung; percussion still giving a clear sound in that region. Pulmonary emphysema is the only disease which can be confounded with this group of signs."

As I have had no opportunity of studying the cases of bronchial obstruction described by Andral and Reynaud, I cannot put forward any original observation upon them. Yet I can scarcely agree with the first of these authors, in his opinion that they may be confounded with Laennec's emphysema, for although this particular form of bronchial obstruction has not come before me, yet in cases of foreign bodies in the trachea and bronchial tubes, and in compression of either bronchus by external tumours, I have had many opportunities of studying the stethoscopic signs which result from complete or partial obstruction of a large tube, and of convincing myself that between the phenomena thus produced, and those of bronchitis with dilatation of the air cells, there are generally remarkable differences.

We may divide the cases of this kind of bronchial obstruction into two classes; first, those in which it is complete, and next, those where it is only partial. Now, in the first of these cases the physical signs are totally different from those of Laennec's emphysema; for we have *complete* absence of respiratory murmur, and of the other signs which indicate permeability of the lung, the sound on percussion remaining unaffected; circumstances the very opposite to those in emphysema, in which there is never complete impermeability, and in which the sound on percussion becomes increased in proportion to the extent of the disease.

In the second class, the phenomena of which may be studied in cases of foreign bodies not completely obstructing the bronchus, and in those of partial compression of the tube by external tumours; the signs, in the early periods at least, are also different from those of emphysema. The respiration indeed is feeble, but pure, the sound on percussion unaltered, and the peculiar crepitating, sibilous, and mucous rales altogether wanting. There is no evidence of increase of volume of the lung, and if signs of bronchial irritation supervene, they are consequent to the feebleness of respiration; the very reverse of what occurs in dilatation of the cells, which, in almost all cases, is produced and preceded by a bronchial irritation.

Lastly, the history of the case, the accompanying symptoms, and the period of duration of the physical signs, will greatly assist us in forming a correct opinion.

Before proceeding to some of the other varieties and results of bronchitis, I shall endeavour, according to the plan of this work, to throw into separate propositions the state of our knowledge with respect to the physical diagnosis of simple bronchitis.

1st. That in almost all cases percussion gives no direct sign.

2nd. That an accumulation of mucus in the inferior portions of the lung may give a certain degree of dulness.

3rd. That in the great majority of cases, in which there is a co-existence of the signs and symptoms of bronchitis with dulness, we may infer the existence of some disease, either of the parenchyma or of the pleura.

4th. That conversely, the absence of dulness with the existence of irritation of the lung, gives a great probability that the case is one of simple bronchitis.

5th. That a copious effusion of muco-purulent matter may exist in the bronchial tubes, without perceptible dulness of sound on percussion.

6th. That in certain cases of bronchitis with effusion, a metallic sound may be produced on percussion. This is somewhat similar to the *bruit de pot fêlè* of caverns, but is to be distinguished from it by the clearness of sound, its greater diffusion, and the absence of the stethoscopic signs of a cavity.

7th. That in many cases, on application of the hand, a distinct vibration is felt in accordance with the motions of respiration.

8th. That the modifications of respiration, as observed by the stethoscope in bronchitis, seem to be connected with mechanical obstruction more or less complete, and which may proceed from one or all of the following causes: turgescence or hypertrophy of the mucous membrane, the existence of various secretions, and lastly, the occurrence of spasm.

9th. That in the mode of occurrence of the various phenomena there are the greatest possible differences in different individuals.

10th. That as a general rule it may be stated, that the more intense the sonorous, sibilous, or mucous rales, or any combination of them, be during ordinary respiration, the more severe may the disease be considered.

11th. But that in certain cases of intense bronchitis of the minuter tubes, the sounds during ordinary respiration cease to be a measure of the intensity of disease, as they become louder during the convalescence of the patient.

12th. That in the secretive stage of bronchitis the mucous rattle may occur, on the one hand, with large and isolated bubbles, and on the other, may pass into a rale almost crepitating, the sound on percussion still continuing clear.

13th. That in consequence of bronchial inflammation the entrance of air into a certain portion of the lung may be prevented, under which circumstances the signs are nullity of respiration, with persistence of clearness of sound.

14th. That this obstruction may result from an organic change of the mucous membrane, or from the plugging up of the tubes by their own secretion.

15th. That in the first of these cases the absence or diminution of the respiratory murmur is permanent, while in the second it may be temporary, and removable by a fit of coughing; yet even in this case the obstruction by a concrete mucus has continued from the period of its occurrence until the fatal termination.

16th. That if in a case of mucous catarrh a sudden dyspnœa supervenes, with absence or diminution of the respiratory murmur in a particular portion of the lung, this portion also preserving its clearness of sound on percussion, we may make the diagnosis of obstruction of the bronchial tube by its own secretion.

ACUTE SECONDARY BRONCHITIS.

Having now considered the symptoms and signs of the primary bronchial inflammation, in other words, of that form of disease in which the affection of the mucous membrane seems to be the first link in the chain of morbid action, and the fever consequently sympathetic, I proceed to consider the disease in its secondary form, when we find it either as the result of an influence which seems to act on the whole economy; a specific poison which produces various organic and functional lesions, among which that of the respiratory mucous membrane is by no means the least important; or as proceeding from a sympathetic irritation, the consequence of local disease in some other system. I shall, in the first place, examine into the history of the catarrh of typhus fever; next, into that of the exanthematous diseases; and lastly, make some observations on those forms of bronchitis which occur in other specific contaminations of the system, and which may be denominated the chronic secondary catarrhs; and on the sympathetic coughs from irritation of the digestive system.

Bronchitis of Typhus Fever.—The occurrence of bronchitis in cases of typhus is not constant; and even when it exists, it is often slight, and easily manageable. But on the other hand, the pulmonary system may be severely attacked, and death induced by asphyxia from excessive secretion of the bronchial membrane. We commonly meet with this severe form under two circumstances; the one where the symptoms are manifest and distressing, the other in which the disease is latent and insidious. But in one respect both these forms agree, namely, that at an earlier period than in the idiopathic catarrh, secretion generally comes on in enormous abundance, and is too often the immediate cause of death. As far as I have seen, the great majority of patients in fever, who have died with what is called effusion into the chest, owe their death to this disease, which has been overlooked, or insufficiently treated. This fact illustrates the want of proportion which commonly exists in typhus fever between the functional alteration and the organic change. With symptoms of an apparently trifling character we may, after death, find universal bronchitis, great congestion, or pneumonia.

In many cases, as Laennec has observed, a bronchitis shall exist through the whole course of a fever, yet so slight as to merit little notice. But in all these cases we must pay a careful attention to the chest, for we know not the moment at which this trivial disease may assume a dangerous character; and hence, when we discover any increase in the bronchitic symptoms we should immediately direct our attention to the lung, and, if possible, arrest the progress of the local disease.

In other cases, as I have before mentioned, the bronchitis is a prominent and formidable symptom; and in addition to the other phenomena of fever, we find the patient with lividity of countenance, cough, hurried breathing, and expectoration. Finally, though these symptoms be but slightly marked, yet the patient may be labouring under a bronchitis, of the intensity and extent of which nothing but a physical examination can convince us. Such a patient may continue for days with but little apparent suffering of the respiratory system, and be suddenly cut off by a super-secretion from the bronchial mucous membrane.

This form of disease is commonly co-existent with more or less of gastro-enteric inflammation, thus forming one of the most fatal varieties of fever in this country. In some instances the disease predominates in the respiratory, in others in the digestive system; and I have often observed a remarkable alternation of this predominance of disease between the thoracic and abdominal cavities. Thus, suppose to-day we observe the breathing hurried and laborious, the cough troublesome, the expectoration difficult, and the stethoscopic signs well marked, the chances are that the abdominal symptoms are less severe, the abdomen is less swelled and painful, diarrhœa has ceased, the tongue has improved, and that characteristic prostration which attends gastro-enteric inflammation has remarkably disappeared. In two or three days, however, the abdominal symptoms return, with decided diminution of those of the chest, and in the course of a single case several alternations of this kind may occur. In such instances death generally takes place by asphyxia; and I have known cases in which the gastro-intestinal mucous membrane was found in so favourable a state as to leave little doubt, that, as far as its organic change was concerned, the patient would have recovered, but for the bronchitis. I think we may state, with respect to the pathology of mucous membranes in fever, that although the gastro-intestinal mucous surface may be, and often is affected, while but little, if any, disease exists in the respiratory organs; yet that the converse of this proposition is seldom true, a point of the utmost importance in practical medicine, as bearing on the application of general, local, and specific treatment.

Physical Signs.—In this form of disease it is often difficult to draw the line of distinction between the disease in the mucous membrane, and a congested or even inflamed state of the pulmonary parenchyma; and hence, the physical signs cannot be so accurately defined as in cases of simple idiopathic bronchitis. Thus, although the sound on percussion is generally clear throughout the whole disease, yet in certain cases we observe a diminution of sound generally occupying the lower portion of one side, but never amounting to complete dulness. In some cases, indeed, it is so slight as only to be ascertained by careful comparison. This is an unfavourable sign, as shewing that we have something more to contend with than bronchitis, and pointing out that congested state of viscera so dangerous in the progress of a typhus fever. The stethoscopic signs are subject to the same irregularities, and the rales become sometimes so fine as to be hardly distinguishable from those of pneumonia, a circumstance attributable to the complication with pulmonary congestion. We may also observe that the position of the patient has a remarkable influence on the physical signs, which is rarely observable in the idiopathic bronchitis. Thus, if the patient has lain all night on the left side, we may find this portion of the chest somewhat duller on percussion, with more intense rales, and less vesicular murmur. To this subject I shall return when speaking of pneumonia, and shall merely remark, that the fact is explicable by the debility of the patient, and probably also by the dissolution of the fluids which occurs in such cases; and accordingly on dissection, we find the lower portions of the lung, more or less in a state of congestion, bordering upon hepatization: the tissues also present a remarkably livid hue, and are generally softened.

In describing the stethoscopic signs of this form of bronchitis, I may observe, that there is no essential difference between them and those of the primary species. All the varieties and combinations of the dry and humid rales are met with, their intensity being regulated by that of the diseased action. But independent of the mere characters of physical phenomena, we find some accompanying circumstances of difference between the two affections.

The first, and most important, is the want of proportion between the intensity of the phenomena and the sufferings of the patient; the former being extreme, while the latter, at least until the last stage, are comparatively trifling. This we find in that variety of the disease, where the bronchitis, *quoad* its symptoms, is nearly latent, thus constituting a remarkable difference in the disease, as compared with the primary form, in which the proportion between the symptoms and signs is much more direct.

The second point of difference is closely connected with the former. It is that the intensity of the rale during ordinary breathing is, in many cases, not a measure of the violence of the inflammation or congestion of the air tubes. Thus, during ordinary breathing the rales may be but slight and diffused, and yet on a forced respiration become most intense. This seems owing to the great obstruction of the minute tubes, coupled with the debility of the patient. But as the disease subsides, we have a loud rale during ordinary respiration, so that then the increase of rale points out a decrease of disease. To this point I have already alluded when speaking of the signs of bronchitis.

A third distinction may be made with respect to the frequency of the occurrence of certain characters of rale. In the primary bronchitis, a mucous rale, so fine as to be scarcely distinguishable from crepitus, is by no means uncommon, and shews that the disease has affected, if not the air cells, at least those finer tubes which pass into them. Now in the bronchitis of typhus, unless when complicated with congestion or pneumonia, when the sound becomes dull, the rales are much more of the musical than of the crepitating character; from which I would conclude, that the disease more especially affects the large tubes, where the lining membrane has the proper characters of a mucous structure. Louis has shewn, that of the different tissues the serous membranes are the least liable to disease in typhus; and if the structure of the minuter tubes and air cells approach to that of the white tissues, we may understand why such parts of the lung are less liable to the secondary diseases of typhus.

Lastly, we find that in the severe bronchitis of typhus fever, the morbid phenomena predominate more remarkably in the lower and posterior parts of the lung; where, as I have before mentioned, they are occasionally combined with signs indicative of a congested state of the cellular structure of the lung.

I shall next proceed to consider bronchitis in relation to the exanthematous diseases.

It seems now established that we may consider these affections as examples of specific fevers, characterized by the production of secondary irritations, not only of the surface, but of the internal parts, the disease of the skin thus forming but a single link in the chain of morbid actions. Nor is the cutaneous irritation the first of the secondary affections, at least in the greatest number of cases, for the viscera seem, in almost all instances, to be the first to suffer, a fact proved by the occurrence of signs of this irritation, superadded to the general symptoms of the precursory fever. In this way all the viscera may be affected, and convulsions, cough, vomiting, or diarrhœa are met with. On the appearance of the cutaneous eruption, however, this internal irritation either subsides or becomes greatly modified; while in other cases, where the eruption is either wanting or insufficient, the visceral disease may run on to a fatal termination. We find, further, that if the cutaneous irritation, which may be considered as a natural revulsion from the viscera to the surface, be repressed, visceral inflammation is again lighted up, and that this may occur even at the natural period of the subsidence of the affection of the skin.

But while, in the actual state of medicine, we must disbelieve the doctrine of these affections being purely cutaneous, so, on the other hand, we cannot admit the opinion of the pure solidists, who explain all the phenomena by the sympathetic effects of primary visceral irritation. All the arguments against the doctrine of the localization of fever apply equally in the case of the exanthematous diseases, for they agree with typhus in the circumstance of periodicity; and in the local affections not being primary, constant, or in proportion with the general symptoms; so that we must consider their local irritations as generally analogous in their pathology to those of typhus itself.

But between these affections we may draw one line of distinction, although, after all, it amounts but to a difference in degree. The secondary irritations in the exanthemata are more violent, more constant, and consequently of more importance in these diseases than in typhus. The inflammations, too, have (at least in measles and the ordinary scarlatina) more of the sthenic character; and the liability to inflammatory action seems to continue longer after the subsidence of the original disease.

This complication with visceral disease was not unknown to the older authors, but it is to Broussais that modern medicine owes the most important illustrations of the subject; and if we leave aside the conclusions into which his pure solidism led him, we find a mass of important observations on the diseases in question. After describing the progress of a case of measles, he observes, "Such is the natural, or, more properly speaking, normal progress of measles, but how many are the chances that cause it to deviate! Sometimes inflammation, and the spasm consequent upon it, predominate in the bronchial tubes, and destroy the patient by suffocation; at other times, the bronchitis, which was supposed to be near a termination, involves the parenchyma, and is converted into a pneumonia or pleuritis. In other cases, particularly in adults, whose digestive organs have been long subject to irritation, gastro-enteritis becomes the predominant phenomenon, or combines with the pulmonary inflammation in producing a fatal result. Occasionally the irritation is transmitted to the encephalon, and the patient suffers from all the consequences of such a metastasis. Finally, there are circumstances in which the inflammation becomes chronic and apyrexial, at one time in the air passages, where it causes phthisis, at others, in the digestive tube, where it maintains a chronic inflammation of the stomach, small intestines, and colon. Hence comes the accredited opinion of the older physicians, (who knew no other practice than the evacuation of the humours,) that measles require, after their disappearance, the repeated use of purgatives."

I have quoted this passage, as it forcibly and truly describes the circumstances which attend so many cases of these eruptive diseases, and strongly directs the mind of the practitioner to the state of the viscera. It is to be regretted that as yet the importance of these considerations has not been sufficiently insisted on in our schools of medicine, and that so many practitioners continue to regard these diseases merely as affections of the skin, forgetting, that as it is by the viscera we live, so it is by them we die. Almost all the erroneous practice in these affections can be traced to the overlooking of this most essential point. Here, however, I feel happy in bearing my testimony to the fact, that among the British systematic writers on medicine, Dr. Mackintosh is the only one who has fully developed the general pathology of the exanthemata; and his writings on this subject must be productive of the most extensive and still increasing benefit.

When we consider the phenomena of the different exanthemata, we must observe, that although there is no constant relation between their separate species, and the affections of particular viscera; yet that, in many cases, there is evidence of some greater connexion with disease of certain organs than with that of others. Thus, with respect to the pulmonary system, its irritations are more commonly met with in measles and scarlatina than in variola or erysipelas, which seem more closely connected with the digestive system. That we may have pulmonary irritations, occurring with these latter diseases, and abdominal affections with the former, is fully admitted; but still the rule seems to hold good, that the poisons of measles and scarlatina, in their operations on the economy, fall more on the respiratory than on the digestive system. We find that previous to the eruption, in almost all cases, and in some, even before any fever is established, there are signs of irritation of tho bronchial mucous membrane. These often go on increasing until the eruption makes its appearance; when, as it were by the revulsion to the surface, a degree of relief is afforded to the pulmonary system. Should the eruption be repelled we see the bronchitis again lit up; and even at the period when the cutaneous efflorescence should naturally subside, there is the greatest liability to dangerous inflammation of the chest.

An interesting question here presents itself: is the inflammation of the mucous membrane in these diseases specifically different from that in idiopathic bronchitis? This is a point on which anatomy sheds no light, nor is it probable that it ever will. We want a series of observations on the symptoms and history of the pulmonary irritations of the exanthemata, as compared with idiopathic affections, which might throw great light on the subject. Until this is done, we can only conjecture. But this much may be said, that while, on the one hand, we meet with many instances in which the visceral irritation is mild and not extensive, so, on the other, we find that some of the most violent and intractable cases of bronchitis, and its consecutive pulmonary irritations, are met with in connexion with these diseases.

Under these circumstances we find intense bronchial inflammation; the combination of this with pneumonia; or, as I have witnessed more than once, pleuritis, with a copious and rapid sero-purulent effusion. We may also have a general development of tubercle, in which case its connexion with the inflammatory action is too obvious to be overlooked.

I have before alluded to the differences in the several characters of the secondary irritations of the ordinary measles and scarlatina, as compared with those of typhus, and have shewn that they have more of a sthenic character. But in one respect they may be said to differ anatomically, namely, that in these affections there is a much greater likelihood of the serous membranes becoming engaged than in typhus. Arachnitis, pleuritis, and peritonitis are not unfrequent; a fact of great importance in our prognosis and treatment, and one of interest in connexion with the statement of Louis, to which I have already alluded, when speaking of the physical signs in the bronchitis of typhus fever.

CHRONIC SECONDARY BRONCHITIS.

In discussing this subject I shall content myself with briefly pointing out the most remarkable instances of bronchial irritation connected with those slower actions which result from chronic constitutional disease, and then notice the subject of the sympathetic affections of the lung consequent upon abdominal irritations.

I quite agree with Dr. Graves in regretting that this essential question in the pathology of bronchitis should have been so much neglected by investigators on the subject. We have seen what an important part the affections of the bronchial membrane take in those contaminations of the system which we call fevers; and there can be no doubt, that in many other specific affections there are corresponding diseases of this tissue. Thus, the gouty, scrofulous, syphilitic, and scorbutic contaminations, may, and no doubt do, produce their specific forms of bronchial inflammation. And even though as yet pathological anatomy has not revealed any organic differences in these lesions, whether as compared with the idiopathic disease, or among one another, yet that their peculiar character is shewn in their history, symptoms, and the result of treatment, every unprejudiced and practical man must allow.

Thus, in the gouty habit we see attacks of irritation in various organs, among which the bronchial membrane may be affected, and the patient labour under a severe and obstinate cough. And even, as has been well remarked, an attack of bronchitis from cold, in the same diathesis, will often shew itself with the peculiar characters of a gouty affection.

The gouty irritations of the lung occur under various forms and circumstances. Thus, cough, dyspnœa, and expectoration may precede a fit of gout, and rapidly and completely subside on its appearance; on the other hand, these symptoms may follow the subsidence of the arthritic attack. A patient may present all the symptoms which have been supposed to belong to hydrothorax, but which are really the consequence of pulmonary congestion and inflammation, and these shall alternate with gout. Or we may see a case, in *which such symptoms having been removed by appropriate treatment*, a fit of gout has immediately appeared. We may further observe more complicated cases, such as the succession of epilepsy, gout, and fatal bronchitis; or inflammation of the trachea, slight general arthritis, glandular enlargements, gout. Other examples might be given, but enough has been stated to prove, that the respiratory system may be affected, either primitively or consecutively, by the gouty irritation. Whether in such cases the lesion is in any anatomical character different from idiopathic bronchitis is still to be determined, but it seems probable, that like other analogous affections, its specific character will be found more in its mode of invasion and amenability to certain remedies, than in its anatomical nature or seat.

I shall next allude to a form of secondary bronchitis, which, though as yet little understood, demands a full and most careful investigation, I mean a peculiar bronchial irritation, arising in consequence of the syphilitic contamination of the system, a disease which seems by no means unfrequent.

That the syphilitic virus should affect the viscera, seems so probable from analogy, that it is strange how this part of its history should have been so long unexplored. In fevers, in the exanthemata, in scrofula, in gout, and other constitutional affections, we see visceral diseases taking a most prominent part in the morbid phenomena; and that syphilis should constitute an exception to a law so general seems in the highest degree improbable. The pathologist has examined its effects on the external parts, and the bones, &c., but has done little indeed in a field perhaps equally important. His researches on internal syphilitic disease have been crude and scanty; and the affections of the pharynx, the windpipe, the rectum, and the genito-urinary system, are all that have arrested his attention.

It seems to have been believed by those authors who have opposed the doctrine of a syphilitic virus, that the viscera escaped the disease. "Nothing," says Broussais, "proves that such a virus may be preserved and reproduced in the economy, so as to cause visceral inflammations or sub-inflammations." Yet the same author soon after speaks doubtingly on the subject, and declares, that new researches and experiments are necessary. We might suppose, from the general silence of authors on the subject, that these specific visceral irritations were rare, and probably often confounded with idiopathic affections. Yet the records of medicine are not deficient in examples of cures of pectoral and abdominal consumptions, presumed to be syphilitic, by the use of mercury. The opposers of the doctrine of a virus refer the occurrence of such diseases to the treatment as much as to the disease, but give a melancholy instance of bad reasoning and prejudice, in also attributing the cure by mercury to a revulsive counter-irritation. Mercury then, according to them, produced the disease which they afterwards cannot deny that it cured.

In these diatheses, or morbid constitutional states, we may observe the occurrence of local disease under two circumstances: in the one, it seems to be the immediate effect of the contamination, as we see in the pustules of variola; and in the other, we find that in a system already contaminated, other causes acting, a disease may be developed, which is so modified by the constitutional state as to show itself in some different form from its idiopathic characters. Thus, in the scrofulous or gouty diathesis, common exciting causes will produce inflammations of peculiar characters, and so it is probably in the syphilitic state.

But to come to our subject, the syphilitic poison, in its action on the viscera, seems more often, or at least more prominently, to affect the respiratory system. Thus, the frequency of laryngeal affections in syphilis has been long admitted, to which I shall again allude, in speaking of the diseases of the windpipe.

With respect to the bronchial system, we may observe the disease as an acute, or more chronic affection. In the first instance, it is analogous to the bronchial irritations of the exanthemata, of which I have seen a few interesting examples; while in the second, there is a chronic irritation, which, when combined with the syphilitic hectic, and with periostitis of the chest, closely resembles true pulmonary phthisis.

In the first of these cases I have observed, that after a period of time from the first contamination, the duration of which has not been determined, the patient falls into a feverish state, and presents the symptoms and signs of an irritation of the bronchial membrane. These having continued for a few days, a copious eruption, of a brownish red colour, makes its appearance on the skin, and the internal affection either altogether subsides, or becomes singularly lessened. Here we see the bronchial membrane taking on an action which is peculiar, and very different from its ordinary irritations. There is an inflammation, only analogous to that of the exanthemata, and no doubt can exist that it is connected with the syphilitic poison.

My friend, Dr. Byrne, whose situation as medical officer to the Lock Hospital, gives him the greatest opportunities of observation, informs me, that he has, in many instances, seen patients, who had been formerly diseased, and who had come into hospital either for new sores, or for gonorrhœa, attacked with intense bronchitis, and fever. This attack would come on suddenly, and the distress was so great, that bleeding had to be performed. The effect of which was, that soon after a copious eruption, often combining the lichenous and squamous forms, made its appearance, with complete relief of the chest. In some of these patients, on the day before the eruption, the stethoscopic signs had been those of the most intense mucous irritation; and yet, when the skin disease appeared, *the respiration became either perfectly pure*, or only mixed with an occasional rhonchus in the large tubes. The same gentleman has observed the reverse of this: as when a syphilitic eruption has been repressed, the bronchial membrane has become much engaged, and the patient affected with general febrile symptoms. These phenomena subsided after bleeding and mild diaphoretics, which had the effect of restoring the cutaneous eruption. Here we have an additional evidence in favour of the analogy between this syphilitic bronchitis and that of the exanthemata. No doubt the occurrence of an idiopathic bronchial irritation might cause the temporary suspension of the skin disease, but still the fact above stated adds great weight to the opinions which I have advocated. Other medical friends have mentioned to me, that they have observed similar cases; and I shall only add, that the subject promises a fair field for pathological inquiry, and practical improvement.

The attention of the profession has been recently called to the more chronic form of the disease, by Dr. Graves, in his published lectures. He remarks, that the possibility of syphilis attacking the pulmonary system was not unknown to the older authors, but that since it had been placed by systematic writers among the diseases of the skin, this idea seems to be abandoned or forgotten. He entertains a firm conviction, that the syphilitic poison may affect the pulmonary, as well as the osseous, cutaneous, or mucous tissues, a point of doctrine which I look upon to be completely established. Dr. Graves' observations on the diagnosis are too important to be omitted here. He says, " If the patient's sufferings have commenced at the period of time, after primary sores on the genitals, when secondary symptoms usually make their appearance; if some of his complaints are clearly traceable to this source; if, along with debility, night-sweats, emaciation, nervous irritability, and broken rest at night, we find cough; and if this group of symptoms have associated themselves with others, evidently syphilitic, such as periostitis, sore throat, and eruption on the skin, then we may, with confidence, refer all to the same origin, and may look upon the patient as labouring under a syphilitic cachexy, affecting the lungs as well as other parts. In forming this diagnosis much caution and care are necessary, and we must not draw our conclusion until we have repeatedly examined the chest by means of auscultation and percussion; if these fail to detect any tangible signs of tubercles, we may then proceed to act upon our decision with greater confidence, and may advise a sufficient but cautious use of mercury. Under such circumstances it is most pleasing to observe the speedy improvement in the patient's looks and symptoms; the fever, night-sweats, and watchfulness diminish, he begins to get flesh and strength, and, with the symptoms of lues, the cough and pectoral affection disappear. I am not prepared to say which of the pulmonary tissues is most usually attacked by the venereal poison, but I believe that it chiefly tends to the bronchial mucous membrane, although, like other animal poisons, *e. g.*, those of measles and scarlatina, it may also occasionally produce pneumonia."

To these valuable observations it is unnecessary for me to express my assent; but I cannot sufficiently impress the importance of making a careful physical examination of the chest. The great frequency of phthisis, and the liability to its supervention in the strumous habit, when syphilis and mercury combine to undermine the constitution, are circumstances never to be lost sight of. To this point I shall return when I describe phthisis, and here only remark, that the principal ground on which I rely for the diagnosis between this syphilitic irritation of the bronchi, and tubercle, *is the want of accordance between the physical signs and the constitutional symptoms.* The latter are often those of phthisis in an advanced stage, while the former point out no amount of disease at all commensurate with the symptoms. The value of this is at once seen when we recollect, that in almost all cases of true phthisis, which have gone on to the production of decided hectic and emaciation, there are manifest physical signs of tubercle.

In concluding my observations on the secondary constitutional irritations of the bronchial membrane, I feel that I have by no means done justice to this most important subject. Thus I have not dwelt on the connexion of bronchitis with scrofula and scorbutus, as alluded to by Dr. Graves, or with erysipelas, which has been so strongly dwelt on by Dr. Mackintosh. But if what I have said be sufficient to draw attention to the general history and pathology of the constitutional affections of the lung, I shall be satisfied, and conclude by pointing out what seem to me to be the desiderata of the subject. These are

First. To determine what are the tissues engaged in each of these cases.

Second. To ascertain whether any anatomical difference can be shewn between these diseases and the idiopathic bronchitis; and

Third. To determine how far the ordinary treatment of bronchitis should be modified according to its constitutional exciting cause.

SYMPATHETIC COUGH.—Under this head I shall notice two principal forms of this affection, in both of which the primary irritation resides in the digestive system. These are, first, the cough which results from gastric inflammation, and next that from intestinal worms.

Much, if not all, of our knowledge on the first of these varieties is owing to Broussais, who has so successfully developed the general subject of sympathies, and has shewn how by their preponderance a disease of the digestive, respiratory, circulating, or nervous systems may be simulated. Among these morbid sympathies, one of the most remarkable is that under consideration; for an acute or sub-acute gastritis may produce cough, and if this be violent or long-continued, actual inflammation of the lung.

Before giving the results of my experience on this subject, I shall examine some of M. Broussais's cases, which he has published in his *Phlegmasies Chroniques*. In the first case, the patient had been exposed to great mental and bodily fatigue, and for some time had used red wine for his breakfast in place of coffee. He became attacked with fever, and in the course of a few days complained of severe pain in the chest, and epigastric constriction. There was a constant desire to cough, but the pain prevented its indulgence. On the eighth day, the fits of coughing were violent and unceasing, and the epigastric pain worse. Some leeches were applied to the epigastrium, which removed the pectoral symptoms almost completely, but in two days the fever was again lit up, and the cough reappeared. Violent symptoms now set in, unconsciousness, sighing, stupor alternating with restlessness, and fruitless attempts to cough. The patient died on the eighteenth day.

On dissection the lungs were perfectly healthy, but the stomach was found greatly contracted, and its mucous membrane of so deep and livid a colour as in many points to be almost black. The intestines were also contracted, and with great vascularity of the mucous membrane.

The next case detailed by this author is not clearly illustrative of the point in question, as it seems one of those constitutional affections, marked by diffuse cellular inflammation, and the occurrence of inflammatory action in many of the viscera.

In his third case M. Broussais gives the history of a young man who was attacked with bilious derangement, and distressing cough; on the sixth day he had high fever, dyspnœa, redness of the malar eminences, and a violent cough, not in fits, but in single shocks at each inspiration. This caused great pain, and an expectoration of some frothy and bloody mucus. He had no fixed pain, but the anterior portion of his chest was very tender. There was great anxiety, and the patient uttered plaintive cries, and complained of extremely disagreeable sensations in the mouth.

The patient was twice freely bled, and a blister applied to the thorax, but although the vascular action was reduced, the other symptoms continued, and he died on the sixteenth day of his illness.

On dissection the lungs were found engorged, but not indurated; the stomach was intensely inflamed.

From these cases, as well from others, which are not given, M. Broussais gives the following as the characters of this gastric cough.

It comes on with violent shocks, (*a secousses*,) which occur at each inspiration, and those violent paroxyms, which would produce swelling and lividity of the countenance, are never observed. It is more alleviated by cooling and slightly acidulated drinks than by bleeding; and lastly, with reference to the expectoration, it may be present or absent according to the degree of the bronchial irritation, but its excretion may be suspended by means calculated to relieve gastritis, and this suspension is advantageous to the patient.

I shall now state the results of my experience on this interesting subject.

As the sympathetic irritations of gastritis vary according to the intensity of the disease and the local and general susceptibility of the patient, it is obvious that they will shew themselves under different characters in different individuals; and while, in the one case there may be high excitement of the cerebro-spinal, in another the same may occur with respect to the respiratory or circulatory systems. Of the cause of these peculiar predispositions we are at present ignorant.

The nature of these sympathetic affections seems to be, that they are at first only lesions of function, but that when violent or long-continued, they become complicated with organic change; or, in the language of Andral, the lesion of innervation is followed by that of circulation, nutrition, and secretion: under these circumstances, cough, or palpitation, or cerebral symptoms, which were at first only sympathetic and uncomplicated with organic change in the suffering organ, may become combined with actual disease, the violence, or long continuance of the symptom, being the conditions for this modification.

Now, with respect to the lungs, we find that their functions may be injured, and a sympathetic cough excited, either by an acute or chronic disease of the gastro-intestinal surface. In the first case the symptom is generally more violent; and, from the frequent existence of fever, much more likely to become complicated with pulmonary inflammation. For it seems certain, that the supervention of inflammation in mere functional lesion is much more probable when a febrile state exists.

We may see a patient with the most aggravated cough, yet with a chest clear on percussion, and the murmur either pure, or mixed here and there with a little sonorous or mucous rattle. This want of proportion between the physical signs and the functional lesion leads us at once to the principle of diagnosis, which may be announced to be, *That when distressing pectoral symptoms exist, the morbid physical signs being either absent, or if present, yet revealing an amount of disease too slight to account for the symptoms, we may make the diagnosis of sympathetic irritation.*

Here the period of duration of symptoms will often be an important element in deciding the question; for it is plain, that the longer the symptoms have lasted, without corresponding physical signs, the less is the chance of actual disease of the lung. If a patient has had fever, cough, and hurried breathing, for three or four days, and that even then no commensurate signs exist, we may be tolerably sure that there is no actual or progressive inflammation, for if there were, it would have by that time, at least, fully manifested itself.

The negative results of the examination in this case are of the greatest value; indeed a more beautiful and practical application of the stethoscope can hardly be mentioned. From the similarity of the symptoms the disease is constantly mistaken for bronchitis and pneumonia. The characteristic symptoms of gastritis are overlooked, and its sympathetic relations alone attended to. In consequence of this error in diagnosis the most fatal mistakes are committed. Patients labouring under gastritis, or gastro-enteritis, have been largely bled, and thus thrown into a typhoid state; or the abdominal inflammation has been exasperated by the use of remedies intended to relieve the pulmonary irritation.

In making this diagnosis the following are the principal points which must be attended to in order to avoid error:

First. Whether the symptoms or signs of incipient tubercle are absent.

Second. Whether there is reason to suspect disease of the larynx or trachea.

Third. Whether the uvula be or be not relaxed.

Fourth. Whether the patient (if a female) be subject to hysteria.

I have given the above cases, as they constitute the principal sources of phenomena similar to those in the sympathetic cough of gastritis, or of worms. If the result of the investigation is against the existence of any of these causes, we may safely, indeed, conclude upon the abdominal origin of the cough; and it will not be difficult to decide between gastritis and the irritation of worms.

I have observed this sympathetic disturbance of the lung from gastric irritation or inflammation, more often as an acute than a chronic disease. And in all these patients the cough was relieved, and the pectoral distress removed, by treatment directed to the stomach. In most of the cases which I have seen, the disease had not been modified by any previous treatment, and these yielded to the usual means for the cure of gastritis. In others, the efforts of the practitioner had been entirely directed to the lung, and general bleeding performed. Leeches, cupping, or counter-irritation had been used to the chest, and the ordinary internal remedies successively and unavailingly employed. Under these circumstances, the omission of all internal stimulants, the application of leeches to the epigastrium, the use of iced water, and a bland diet, have completely and rapidly removed a cough which had resisted the means, which, in the primary catarrh, would have, in all probability, succeeded.

Lastly, I have observed, that in cases of gastritis with sympathetic cough, and acceleration of breathing, which had done well, an excess in diet, during convalescence, brought back the original symptoms; and these again yielded, in some cases, merely to a change in regimen, while in others, more decided measures had to be employed.

But the discovery of a sympathetic cough should not put the practitioner off his guard with respect to the chest, for so long as this continues, the lungs will be liable to organic disease. In an acute case, he must, from day to day, examine the chest, so as to assure himself that the change from functional to organic disease has not occurred.

I have seen this change to occur so rapidly that decided dulness has been produced in a single day. Here the importance of physical diagnosis is obvious, for there is often no characteristic change in the symptoms.

In the chronic irritations there is reason, among other lesions, to suspect the growth of pulmonary tubercle.

I shall lastly make some observations on the sympathetic cough, which occurs from the irritation of intestinal worms, and which, although not a constant, is by no means an unfrequent symptom. Thus, most of the systematic works contain examples of cough apparently connected with this affection, inasmuch as it resisted the ordinary means directed to the chest, and subsided under the use of anthelmintics. But the subject has not been investigated with sufficient attention, and I regret that in this place I can only give the result of my passing observations, rather than that of any connected inquiries on the point.

This affection seems to exist under two principal forms; in one of which there is decided inflammation or irritation of the mucous membrane, while in the other, this is either absent, or if present, seems so inadequate for the production of the pulmonary distress, that we cannot help looking upon it as accidental, and probably consecutive to the functional disturbance. Under the latter circumstances there may be a great variety in the cough, but in general its character is more or less spasmodic, occurring in fits, or it may be solitary, hard, and loud; and it is generally either dry, or with a very scanty mucous expectoration. This cough may co-exist with the other symptoms of worms, or may be the prominent indication; and in most cases that I have seen, it occurred without fever.

Such cases are often mistaken, and the patient injured by a variety of ineffective and violent treatment; and until the history of the disease is more accurately determined, such errors will be unavoidable. We may enumerate, however, certain circumstances, which should lead us to suspect the true cause of the cough. These are,

First. Its character; the cough, whether it be laryngeal or pulmonary, being generally spasmodic, often violent, and almost always dry.

Second. The absence of physical signs of pulmonary disease; or if they be present, their want of proportion to the symptoms. In this investigation both the active and passive signs must be carefully examined. It is obvious that the longer this want of accordance between the physical signs and functional lesion has existed, the greater will be the probability that the cough does not proceed from primary irritation of the lung.

Third. The absence of symptoms of laryngitis, or organic disease in the vicinity of the trachea.

Fourth. The healthy state of the pharynx.

Fifth. The failure of treatment directed to the chest, whether of an antiphlogistic or antispasmodic nature.

The combination of these circumstances in a young person, and particularly one in whom, from other considerations, we might suspect worms, should lead us strongly to the belief in their existence. If the patient be a female we should carefully examine whether she has been of an hysterical habit, or whether any symptoms of hysteria accompany the cough; for although this protean disease may itself proceed from worms, yet this is comparatively rare; so that the combination of hysterical symptoms with the cough would tend to invalidate the diagnosis.

But in the first variety there is such an amount of mucous irritation, as to give a character to the disease quite distinct from the last. I have observed this sympathetic bronchitis principally in children; and have found that it was, in some cases, a continued, while in others it shewed itself as a distinctly remittent inflammation.

In the first case a decided bronchitis may be established, which may go on to the production of parenchymatous disease; and in this way I have seen it to induce chronic pneumonia and emphysema of the lung. In several cases too I think I have been able to trace the occurrence of phthisis to this cause. This form of pulmonary irritation from worms seems, however, the rarest; that which I am about to describe appears much more common.

It is now several years since I first observed this remittent irritation of the lung, and connected it with the existence of intestinal irritation. The following case will give a good idea of its characters.

A child of a lymphatic constitution had laboured for some time under a severe cough, with frothy mucous expectoration, which was always worse at night, when a violent exacerbation came on, accompanied with great dyspnœa, wheezing, restlessness, and high fever. These exacerbations had of late become better marked. After his admission into hospital I found that there were the greatest differences in the stethoscopic signs, according to the period when the examination was performed. If the chest was examined at night, when the constitutional and local symptoms were severe, the most intense sonorous rale was audible over the entire chest, so as to obscure all vesicular respiration; but as the day advanced, and the fever subsided, this phenomenon also disappeared, leaving the respiratory murmur almost free. When the child was seen in the afternoon he was quiet and cheerful, and appeared free from all pulmonary disease; but as night approached, the symptoms and physical signs would return, and for a period of twelve hours or upwards the stethoscope indicated the most acute bronchial inflammation. These symptoms continued for many days, during which the ordinary treatment for bronchitis was carried into the fullest effect, *but without the slightest success.* At this time an accidental circumstance led me to take a different view of the case; the belly had become swollen and tympanitic, and to relieve this condition I administered a dose of castor oil and turpentine, which was followed by the evacuation of a number of small thread worms (*oxyuris vermicularis*): that night the breathing was less difficult, and the sonorous rale not so intense as previously. The nature of the case was now more evident, and reflecting on the failure of our former treatment, I thought it probable that the case was really one of worm fever, with a sympathetic bronchitis occurring at each exacerbation. Under these circumstances, I determined on following up the anthelmintic plan, and the turpentine having produced too severe a purging, with prolapsus ani, the syrup of cowhage, alternately with small doses of castor oil, was substituted. He continued to pass the worms in enormous quantities, and each morning the bronchitic rales were less and less evident. In about twelve days the symptoms and signs, which from their severity had threatened the life of the patient, had completely disappeared, leaving the respiratory murmur perfectly natural.

Since the occurrence of this case I have seen many others presenting the same phenomena, though not in so violent a degree; and in several of them the remittence of the bronchial irritation has been a most important element in the discovery of the nature of the disease.

There is lastly one remark to be made, which applies to all these forms of bronchial irritation, namely, that the more severe be the sympathetic affection, the less the likelihood of our finding the usual symptoms of gastritis in the one case, or of worms in the intestines in the other. This is merely an illustration of one of the most important and extensively applicable laws in pathology; that when the sympathetic affections of any local irritation become prominent and severe, the proper or usual symptoms are proportionably diminished or obscured. Their absence, then, in such a case, does not necessarily imply the absence of the disease, which may be present, but shew itself by other functional lesions.

Having now examined into the symptoms and physical signs of the simple bronchitis, and taken a sketch of it in its secondary forms, I should proceed to examine into some of the more remarkable consequences of this lesion, such as the obliteration of the tubes, their opposite condition, or dilatation, and lastly, the dilatation of the air cells. But as these lesions may be described separately, and as they are peculiar results, I shall reserve their consideration until we have examined into the treatment of the disease itself.

TREATMENT OF BRONCHITIS.

In discussing the treatment of bronchitis, we shall first handle that of the simple and mild form, which is commonly met with about the period of the first dentition of children. I have already stated my opinion that this is not a primary disease, but rather secondary to the constitutional disturbance of dentition. Yet as the treatment of the bronchitis scarcely involves the determination of this question, I shall speak of it here. I have already described the symptoms of this affection, and have only to add, that on percussion the chest sounds clear, and that the wheezing rales, of various intensity, mixed with puerile respiration, may be heard; these rales are sometimes partial, in others more general, and often disappear for a time, although the constitutional symptoms continue.

In the treatment of this affection the physician should first satisfy himself as to the existence or absence of fever; for if this be absent his apprehensions need not be much excited, and milder treatment will suffice.

In the apyrexial form our first step is to have the gums freely and completely divided. If it seem probable that more than one tooth will soon appear, the incision should have a corresponding extent, by which the chances of subsequent attacks will be lessened. Objections have been made to this operation, in consequence of the danger of hæmorrhage; yet this must be a very rare occurrence. I have never myself witnessed it, though I have seen the operation performed hundreds of times. It will, however, be advisable that the child's mouth be examined at short intervals of time, after the operation, so as to detect any hæmorrhage, should it occur. The child should be restricted to the use of breast milk, and take some of the hydrargyrus c. cretâ, with rhubarb, followed by a little castor oil, if necessary. These measures having been premised, we then find that the exhibition of ipecacuan in minute doses, has an excellent effect. I direct a grain of hippo, with twenty-four of sugar, to be divided into eight parts, one of them to be given every hour; this remedy will, in a few days, generally effect a cure. In cases where the cough is troublesome, and the child restless, I have seen great advantage from the exhibition of a grain, or a grain and half of Dover's powder, and the same of James's powder, at bed-time; this I have constantly given with the greatest safety.

But we meet with bronchitis in the infant under a much more severe form, where it is accompanied with fever and with the greatest danger to life. This disease is most commonly met with in children who are kept within doors for months from their birth, from which an extreme susceptibility to bronchial irritation is created. The necessity and the safety of bringing the young infant into the open air, in the course of a few days after its birth, is not sufficiently known, and many lives are thus sacrificed to an absurd, ignorant, and destructive prejudice. In such cases we find the child fretful, and with an anxious expression of countenance. The face is often swelled and livid; the breathing is hurried and high; the cough often frequent; the respiration wheezing; the skin hot; and the pulse full and strong. In some cases the digestive system is deranged, and the child labours under thirst, vomiting, or diarrhœa; while in others these symptoms are absent, and the case may be looked upon as simple pulmonary irritation, with sympathetic fever. We often observe that the child has great difficulty in sucking, a circumstance explicable by the dyspnœa which forces it to let go the nipple, and to inhale by the mouth. In some of these cases the schneiderian membrane is irritated, so that the breathing through the nose cannot be effected by the patient.

In the treatment of such a case, the first consideration must be the employment of bloodletting. When the disease occurs in a robust child, and particularly when it has passed the age of a year, it will be often proper to bleed both generally and locally. Blood may be taken from the arm, the back of the hand, or the jugular vein; but we are not to look upon this remedy otherwise than as a preparative for local bleeding, for this seems to be the most important remedy we can have recourse to.*

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* I have known many children lost from an unfounded apprehension of hæmorrhage from the leech bites. This, however, can always be prevented by the following measure: as soon as the leech falls off, the puncture should be dried with a bit of lint, and the operator having prepared a pencil of nitrate of silver, with an exceedingly fine point, should insert it lightly, but rapidly, into the bottom of the puncture, so as to lightly cauterize the part. This operation gives apparently little or no pain, but its success will mainly depend on the freedom from

We almost always find that after the leeching the child's breathing becomes easier, the face less swelled, and the skin cooler; and I have frequently observed the physical signs of bronchitis to be distinctly modified immediately after the operation.

The next thing we have to consider is the use of internal remedies; the two principal of which are the tartrate of antimony, and the combination of calomel and hippo. With respect to the relative advantages of these, I have little doubt that in simple bronchitis, and where the inflammatory symptoms are high, the first is the most important. Indeed there is no remedy that possesses such a decided power over acute bronchitis as this. It may be administered in small or in the larger doses, according to circumstances, but success will depend on the proper selection of the case. If the disease be simple, and in particular free from any gastric complication, if it be in the early stages, before much secretion has taken place, and if bloodletting has been premised, then, indeed, we may often observe an heroic action. The remedy may be persevered in for two, three, or four days, according to circumstances, and should, in general, be omitted gradually.

As the principles of treatment of the second, or secretive stage of the disease in children, are the same as those of a similar condition in the adult, we shall omit their mention in this place, merely observing, that in the employment of blisters, we must use the greatest caution; that they should almost never be applied in the first instance, and that their efficacy will be always insured and increased by the previous employment of bloodletting, and the exhibition either of the tartrate of antimony, or the combination of calomel and hippo.

TREATMENT OF BRONCHITIS IN THE ADULT.—In describing the treatment of any disease it is obvious, that to lay down a

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blood of the puncture. It is often better to direct this measure at once than to lose time with the employment of pressure, or the ordinary styptics.

plan applicable to all cases is impossible; all that we can do is to inculcate the mode of treatment which experience has shewn to be adapted to the majority of cases. This may serve as a landmark, from which in practice we may deviate, according to circumstances. Thus, although the general principle be the same, its application must vary in the young and the robust, in the old and weakly subject, or when the disease is complicated with some acute or chronic affection of the lung or other parts. Let us for the standard, take the inflammatory form of the disease; occurring in a young and robust man, at an early period, and before the affection has been modified by treatment. This is a case which often demands the use of the lancet; and here, as in inflammatory affections of the digestive tube, we bleed with the view of reducing the general fever, and preparing the patient for local treatment; and by diminishing the congestion of the lung, we diminish the chance of pneumonic complication. It must always be recollected, however, that by general bleeding we seldom succeed in cutting short an inflammation of a mucous tissue; and hence it is, that to other means we must look for the reduction and removal of the disease.*

It will always be advisable to empty the patient's bowels as speedily as possible, so as to allow the free descent of the diaphragm. I have seen some cases, in which the employment of judicious means, directed to the chest, totally failed in giving relief until this measure was adopted. But the remedy which will least often disappoint the practitioner is local bleeding, which should scarcely ever be omitted. There can be no doubt, that the local detraction of blood has a more powerful influence on the disease than the general. Its efficacy, however, will be enhanced by being preceded by general bloodletting. In severe cases the patient should be cupped under the clavicles, or between the scapulæ, or a number of leeches may be applied under the clavicles, or into the axillæ. As a general rule it may be stated, that local depletion will be more advantageous when exercised over the upper than the lower parts of the chest. It is not easy to say why this should be the case, but the efficacy of depletions of the larger bronchial tubes in pulmonary disease, and the great utility of treatment directed to the upper lobes of the lung, both in relieving the symptoms of bronchial inflammation and in preventing the development of tubercle, were long since pointed out by Broussais, although subsequent authors have advocated this mode of practice as if it were original with them. He has shewn the intimate relation that exists between bronchitis of the superior lobes, pneumonia, and the development of tubercle; and has announced, that in many cases of incipient phthisis the disease may be put an end to by local depletion of the upper portions of the lung. Such a proposition as this is full of importance, and my experience tends strongly to confirm its truth. When speaking of phthisis, I shall return to this important subject.

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* In this respect we observe a remarkable difference between mucous membranes, and the parenchymatous organs, or even the serous membranes. For in these two last cases, experience shews that general bleeding has a much more direct influence on the disease, in some cases indeed so complete, that the inflammation is cut short by the bleeding alone.

It is scarcely necessary to remark, that under certain circumstances, local bleeding may be repeated even in an advanced stage of the disease. As for instance, suppression of expectoration, when this coincides with increase of fever and irritation;* increase of dyspnœa, when this is not produced by over secretion, a point easily determined by the stethoscope; and lastly, the occurrence of local dulness, which in cases of intense bronchitis may occur, and is owing to congestion of the substance of the lung.

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* I use here the term suppression in contradistinction to that of retention. The first of these terms has been long misapplied, with respect to the chest; for it is obvious, that we should use it with the same signification as in urinary affections.

Next to the means already detailed, we have the employment of internal remedies; there seems to be but little doubt, that in cases adapted for it the solution of the tartar emetic has by far the preeminence, but in its exhibition certain considerations must always be attended to: thus, the more robust the patient; the more acute the disease; the more bloodletting has been indicated, and the better it has been borne; the more inflammatory be the blood; the earlier the period at which the disease has been met by treatment; and last, though not least, the more simple and uncomplicated the affection, particularly with abdominal diseases, the greater will be the certainty of this remedy exercising that singularly sanative action, which has justly obtained for it the name of heroic. On the other hand, where the disease has occurred in a debilitated constitution, where the pulse has not been strong, nor the skin very hot, where the teeth are affected with sordes, and the tongue in a very morbid condition; where the belly is swelled and tender in the epigastric and ileo-cœcal regions; where there have been diarrhœa or vomiting, and pain in the abdomen; in such a case, the tartar emetic will either not be borne at all, or if retained on the stomach, will exercise comparatively little influence on the pulmonary disease, and too often increase the gastric symptoms. It is on the existence of these symptoms of gastro-intestinal irritation that the question of the exhibition of the remedy in any case, in a great measure, must turn. Laennec, indeed, has declared, that the co-existence of the gastro-enteritis of fever with pneumonia, does not contra-indicate the employment of tartar emetic, for which he has been censured, perhaps too severely; and it is supposed, that he allowed his better judgment to be warped, from his hostility to the doctrines of the physiological school. To this point I shall return hereafter.

It would seem, however, that mere prostration should not necessarily prevent us from having recourse to the remedy. Indeed cases are recorded, in which the patient, at the time he was ordered the tartar emetic, was almost in *articulo mortis.* I have never seen such a case, but have often found in the advanced stages of acute diseases of the pulmonary parenchyma and mucous membrane, when other means have either failed, or proved, in a great measure, inefficient, and where the patient was necessarily much debilitated, that the exhibition of the tartar emetic was followed by the happiest results. My experience, at present, leads me to conclude, that where the debility is merely traceable either to the disease or to antiphlogistic treatment, and not the result of its complication with decided abdominal inflammation, we may often have recourse to the antimonial solution; and we shall find, that when managed with judgment and caution, it will then, perhaps, more than at another time, exhibit its almost specific power on the capillaries of the lung.

In the formula which we have used for some years at the Meath Hospital, we have to a certain degree imitated that of Laennec. It is so constituted as to contain an aromatic and an opiate combined with the antimony, and of this solution each ounce contains a grain of the remedy.* Of this solution we begin by ordering half an ounce every hour, or second hour, so that, if possible, the whole of the six grains may be consumed in the course of the twenty-four hours. In many cases, from various accidental circumstances, this quantity is not exhibited, but even where from three to four grains have been used, we have often seen marked benefit to follow.

The results of this treatment are various. In a few cases violent vomiting with purging is produced; but in a great majority there is only a degree of nausea felt, principally when the patient moves. Either of these results is seldom seen after the first day, and the "*interval of tolerance*" of Rasori commonly occurs. In other cases, as Laennec has noticed, almost no apparent effect is produced, and the remedy might be considered as inert, were it not for the disappearance of the symptoms and signs of the pulmonary disease.* In the management of the remedy, as to dose, &c., I have pretty closely followed the instructions of Laennec, though but few cases have occurred to me in which it was necessary to increase the dose beyond eight or ten grains in the twenty-four hours; in the event of too violent vomiting or purging this remedy is at once omitted, and an opiate exhibited. But in all cases in which its action has been salutary, and particularly where it has been found necessary to continue its use for several days, its omission must be conducted gradually. For I have seen many cases in which the sudden leaving off of the remedy was followed by a return of the symptoms. This remark, however, is more applicable to cases of pneumonia and congestion, than to those of mere bronchitis.

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* The following is the formula: ℞ Tartratis antimonii gr. vi. Aq. cinnamomi ℥vi. Tincturæ opii acetatis gutt. xii. ♏.

As far as I have seen, the effect of this medicine on bronchitis is two-fold. It may either, as it were, cut short the inflammation, so as to leave hardly a symptom or sign behind it, or it may cause its early passage into the second or secretive stage. In the first case the oppression and wheezing cease, the cough becomes trifling, the lividity disappears, the pulse falls to its natural standard, and the respiration is found every where pure, equal, and healthy, with the exception, perhaps, of a slight sonoro-mucous rale, which is now and then audible: the patient recovers his appearance, and declares that he is quite well.

In the second case, after the use of the remedy for several days, we find the patient looking pale and miserable; he perspires copiously, and has often a rapid, small pulse; the breathing, though less difficult, is hurried, and the cough, though less painful, is so frequent as to allow of but little rest. It is followed by a copious expectoration of opaque mucus, or of a muco-purulent secretion. On percussion the chest sounds clear, but the respiration is generally marked by mucous rales, of various intensities, in some cases combined with the sonorous, in others passing almost into the crepitating character; at this period antiphlogosis can be used no longer, and a cautious but decided employment of the stimulating and tonic treatment must be had recourse to. But even in this instance, though the exhibition of the tartar emetic has not, as in the former case, restored the lung to a state of health, yet it has not been without its advantages, inasmuch as experience shews that now the exhibition of stimulants and tonics will have the best possible effect. This fact, among many others, seems to me illustrative of a general rule in therapeutics, that in almost all local diseases the successful employment of stimulation depends on the previous use of a general or local antiphlogistic treatment.

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* I have frequently seen patients who were using from six to ten grains of the tartar emetic, daily, yet with a good appetite for their food.

TREATMENT OF THE SECOND STAGE OF BRONCHITIS.—Before entering on the mode of treatment, which experience has pointed out as best for this affection, I find it necessary to premise some general pathological observations. I do not propose entering into the hacknied question of the nature of inflammation, but shall employ the attention of my readers much better in the examination of certain circumstances connected with it, which are of the utmost importance in practical medicine. We find that in a vast number of general and local diseases two stages are observed, the nature of which cannot be expressed by any knowledge to which the mere anatomist can arrive, but whose existence, duration, and succession are pointed out by the results of treatment. With the first of these, pathologists have long been familiar; but of the existence, nature, and frequent occurrence of the second, they have not yet taken sufficient notice. *In the first of these stages antiphlogosis is necessary, and stimulation injurious. In the second, antiphlogosis is insufficient, and often injurious, while stimulation becomes necessary.*

Although much had been done in this field before, yet Broussais had the great merit of shewing, that a vast number of local diseases, before supposed to be separate entities, could be reduced to the first of these stages, the difference of symptoms being principally referrible to the sympathies of organs; but his great error was in stopping short here, and in not recognizing the existence, in almost all local diseases, of a state in which the symptoms do not yield to that treatment which was found advantageous in the earlier periods of the case; or if they do yield, it is only at a great expense to the constitution. As a result of this omission, the treatment of local diseases by the physiological school, was for too great a length a time, purely antiphlogistic, and hence their repeated bleedings and protracted starvations in almost all diseases, and their unfounded dread of any thing which could have the slightest stimulating effect.

But experience has shewn, that this treatment, though so applicable in the first, is often inapplicable or insufficient in the more advanced stages of the disease; that its effects will be to reduce the powers of life, while effusions and super-secretions are running down the patient, and throwing the nervous system into extreme asthenia. It has also shewn, that these symptoms must be met by an omission of all reducing treatment, and by the employment of remedies, the use of which would be highly injurious in the first stages of the disease: but as the period of supervention, and the symptoms of this second, or asthenic state, vary in different individuals, according to a vast variety of circumstances, it is plain, that in the detection of this passage from the first into the second stage, and in the omission of one kind of treatment and the adoption of another, that the skill and success of the experienced physician will be best seen.

Of the different tissues, the mucous membranes, in their pathological state, best illustrate the foregoing propositions, and next to them the skin; but I have almost no doubt that they will be found to apply to the parenchymatous organs, both in cases of local and more general disease. Andral has suggested that the success of tonics and stimulants, in the advanced stages of fever, may be thus explained; and when we consider that in most cases of that disease there are affections of the mucous membranes, and also of the parenchymatous organs, there seems to be great reason for adopting his opinion.

As yet we know but little of the laws which regulate the passage of the first of these stages of disease into the second; but of the truth of the following views, an investigation, conducted with the greatest accuracy that I was capable of, has fully convinced me.

It is obvious that any change in the nature of a local disease, which would render it not only less amenable to antiphlogistic treatment, but in which such a treatment would lose all effect except in lowering the powers of life, must be of the utmost importance. Now when we inquire what are the circumstances which seem to govern this change, we find that they are various. In some cases the chronicity of the disease is presumptive evidence that such a change has occurred; in others, we find it a very early period of the morbid state; and in a third, the first stage continues for an indefinite length of time. The state of the constitution too, has a decided influence, for in some individuals a local inflammation will require tonics and stimulants much sooner than in others, although the seat and nature of the disease be apparently the same. Nor are these the only circumstances, for we find much to depend on the previous treatment, and on the seat of irritation.

I shall conclude this digression, by stating, in the form of propositions, those points of doctrine which seem to bear most directly on the treatment of pulmonary disease.

First. That in some cases an antiphlogistic treatment may cut short the disease in its first stage; but that in most instances, particularly in the affections of mucous membranes, its effect is to bring on the occurrence of the second stage.

Second. That the principal circumstance on which the success of stimulants depends, is their having been preceded by antiphlogistic treatment.

Third. That in many cases disease will continue for a great length of time, and yet (as shewn by the result of treatment) be in its first stage. Although chronic as to its period of duration, it is still acute when tested by the effect of treatment.

Fourth. That this result is most frequently seen under the following circumstances:

(*a*) Cases of local disease, with but little injury to the general health.

(*b*) Diseases of tissues, where there is but little relief by secretion.

(*c*) Diseases of organs which have been neglected, or exasperated by too early stimulation.

Fifth. That in many cases, where the disease has been neglected or exasperated, it will be necessary to precede all stimulants by an antiphlogistic treatment, either general or local.

I wish to be clearly understood, as not putting these views forward as very original. I shall be content if they are thought important. In the treatment, not only of the pulmonary, but I believe of all other forms of the diseases of irritation, they will be found so applicable, as to furnish the true key to successful management, and on the importance of any principle which has a general application in the science of medicine I need not here dilate. The overlooking of this second stage, and the doctrine that disease did not change in its characters or nature, seems to me to have been one of the greatest errors of the physiological school. It was, however, but one of many false conclusions, which the attempt to simplify disease, by reducing it to a common formula, rendered inevitable; and the doctrine, which led to the denial of specific affections, is the same as that which declares for an antiphlogistic treatment throughout the course of a disease, and that one of the most injurious maxims of medicine is that which refers to the necessity of tonics in the advanced stages of bronchitis.

We shall find, that the foregoing views have an important application in the treatment of the second stage of bronchitis, which we may now examine.

We shall first speak of counter-irritation, which may be considered inapplicable in the earlier periods of the disease, so long as the skin is hot, the pulse strong, the expectoration scanty and difficult; in fact, so long as the first stage of the affection continues, that stage in which bleeding and tartar emetic are useful, blisters are inefficacious, and often hurtful. It may be laid down as a general rule, that the longer we can with safety postpone the application of a blister, the greater certainty will there be of its favourable action. I have always found that blisters acted best when they were applied shortly after the change from the first to the second stage of the disease; but even then they might be injurious, if the affection had not been sufficiently modified by preceding antiphlogistic treatment. It is to be regretted, that in this country blisters are too often employed with erroneous views of their mode of action. They are commonly applied in the early periods, and even before any antiphlogistic means, capable of modifying the inflammation, or reducing the general febrile state, have been employed; and hence, as might be expected, their application so far from relieving, not unfrequently aggravates the local disease.*

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* It has often struck me that we take but a limited view of the operation of blisters. We have contented ourselves with considering their revulsive action merely, but have not sufficiently investigated another result, namely, their stimulating effect on the diseased organ. That this effect does occur is known to all practical men, but it is only the injurious result which is recognized, and we never think that there may be a time when this stimulation may have the best effect. The experience of the stimulating action, at all events, proves the fact in question; but whether the stimulation be the consequence of the excitation of the whole system reacting on the suffering organ, or whether it is more directly transmitted, we

In employing blisters, I find that the method of Bretonneau is by far the best, as saving the patient from much torture during the process of vesication, but particularly in the after stages of the sore. In the mode alluded to, the blister is not allowed to remain on after its action has been distinctly felt by the patient. The part is then dressed, and full vesication subsequently occurs. Another great improvement by the same physician is the covering the blister with a single sheet of fine silver paper, through which the vesicating principle from its solubility in oil easily acts; and all the evils which result from the mechanical action of the cantharides are prevented. Stranguary almost never occurs; and I think it will be found, that in many cases this mode of blistering may be used at a much earlier period of disease than under the old system.

In selecting the situation for the blister, we should be guided principally by the physical signs, and in particular by the active and passive auscultatory phenomena.

I have found it necessary, in a few cases, to employ the seton, and it has, in these instances, answered all my expectations. The cases which seem to require it are those where the minute tubes have been affected, where the convalescence is slow and doubtful, and where there are alter-

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at present know not. But we find that at a period when other stimulations are injurious, a blister may do harm; and it seems most probable, that when the second stage of a disease sets in, that then, at least, the utility of blistering is in part explicable by the stimulus given to the affected capillaries, and that it acts in the same salutary manner as internal tonics and stimulants.

It might be urged in opposition to this view, that it seems improbable that a blister, which on the surface produces heat, determination of blood, vesication, &c., should exercise any salutary influence on the capillaries of the lung; but the answer to this is found in the different results of stimulation at different periods, according to the state of the organ; and thus a stimulus, which may produce the worst results on a healthy surface, or on one in the first, or acute stage of inflammation, may produce the best effects when exercised on a tissue in that state which is no longer accessible to antiphlogosis.

nations of an hectic and inflammatory state. In some of these cases the early treatment had not been judicious, and the antiphlogistic had been too soon changed for the stimulating plan. The physical signs were, persistent muco-crepitating rale, and often a degree of dulness in the lower, or middle portion of one side.

Here I may allude to the practice of applying large poultices to the chest, so strongly recommended by Broussais. I have little doubt that in certain cases this measure would be found most efficacious, but having no experience of it, I can only give the statements of others. The above author relates a case of bronchitis, which for thirty-six days had resisted the application of five or six blisters, placed in different parts of the chest, yet which yielded almost immediately to a large cataplasm applied over the front of the chest. Fomentations, according to this author, have nearly the same effect; but the danger of giving the patient additional cold renders them not so advisable as the cataplasms.

From the decided advantage obtained from emollient applications on the abdomen, in the treatment of enteritis, it seems more than probable that the same practice, directed to the chest, would be useful in bronchial and pneumonic inflammations.

In discussing the subject of the internal remedies adapted to this stage, I shall do little more than point out generally the class of agents best adapted to the disease. These may be stated to be tonics, and general and local, or specific stimulants.

Among the two first classes may be enumerated, improvement in regimen, change of air, the use of wine, and in some cases, of bark, or the preparations of iron. Of the local or specific stimulants, on the other hand, so many have been proposed, that I shall merely mention those to which, from experience, I have become most attached. Among these remedies I know none to be compared with the decoction of the polygala senega, in combination with carbonate of ammonia and the camphorated tincture of opium and squill.*

I may safely state, that of all the remedies for the second stage of bronchitis, this, when exhibited at the proper period, has least often disappointed me. Under its influence the expectoration diminishes without increase of dyspnœa; the pulse becomes slower and fuller, the respiration in the upper portions of the lung becomes pure; and this change, extending from above downwards, we may find that, in a very few days indeed, all morbid signs will disappear from the lung.

The whole nicety of the treatment consists in not having recourse to the remedy too soon, in previously modifying the disease by general and local antiphlogistic measures, and by the use of the antimonial or mercurial treatment, as the case may be.

I need scarcely observe, that the above remarks apply not merely to the exhibition of the polygala, but to that of the other remedies of this class. Among these the following are most important: the balsams; and the preparations of gum ammoniac, myrrh, and squill. I have placed the balsams first, as I look on them to be next in value to the senega. But I must state here, that the use of this class of remedies by inhalation has always seemed to me full of danger. I have now known several cases where a chronic bronchitis was converted into an acute, and, as might be expected, fatal pneumonia, by the use of the turpentine inhalations.

It is not difficult to know whether these remedies will be serviceable, even at an early period of their exhibition; and it is the duty of the physician to carefully watch their effects, at least for the first few days. He must never forget, that in all those cases where the cure consists in the arrest of a secretion

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The formula which I commonly employ is as follows:

℞. Decoct. Polygal. ℥v. Syrup. Tolut. ℥ss. Tinct. Op. Camp. Tinct. Scill. āā. ʒii. Carb. Ammon. gr. xv. vel. xx. ℳ.

from an extensive surface, there is a danger, either that a new inflammation will be set up in the affected tissue, or that some other disease, generally of an acute nature, will be produced; for as the sudden arrest of a diarrhœa may produce ascites, or peritonitis, or hepatitis, so that of a bronchial flux may induce a fatal pneumonia, a pleurisy, or an hydrothorax, and to this our attention must always be directed. Experience tells us, that these distressing consequences are best avoided by attending to the following circumstances:

First. To provide that the stimulating remedy shall be preceded by a fit antiphlogistic treatment.

Second. To combine it with a revulsive plan, such as blistering, cupping, warm bathing, &c.

Third. To omit the remedy on the slightest appearance of new irritation, either in the affected part or in any other vital organ.

On the importance of the first of these I have already sufficiently dilated; and shall only add here, that in a single case we may have to return to the antiphlogistic treatment, even more than once. The combination of counter-irritation with the internal remedy seems to have the best effect in preventing these accidents; and the same may be said of means calculated to promote perspiration. In these cases, with this view, I always order the patient to wear flannel so as to promote the insensible perspiration. At this period of the case the exhibition of stimulants may not produce that happy result which I have above described. A state of new irritation may be produced, rendering their omission necessary, or the hectic condition and the super-secretion may continue. The indication in the first of these cases is obvious; in the second, however, we find that this will be the time for a change of air, the remedies being still continued, and we may then see recoveries under apparently the most hopeless circumstances.

I shall next make a few observations on the treatment of the apyrexial form of chronic primary bronchitis, considering it merely as an affection of the mucous membrane, independent of any of its other consequences on the organization of the lung. In these cases, when the disease has continued for a length of time, we often find that a cure is impossible, and our efforts must be directed merely to palliate, and to delay the further progress of disease.

In cases where the disease has not lasted more than a year or two, in which the summer remission has been complete, or nearly so, we may hope to do good. And if we find no evidence of tubercle, dilated tubes, or enlarged air cells, our prognosis will be still more favourable. If, on the other hand, the affection has lasted several years, that the summer remission has become extremely slight, that there is permanent dyspnœa, and that on examination we find the signs of the above diseases, or of morbus cordis, then indeed we must not hope for cure, but we may palliate suffering, and, in many cases, prolong life to a great extent.

The physical signs which are favourable may be stated to be, that the bronchial rales are of a musical rather than a crepitating character; that they are not very intense, nor increased on the patient's taking a deep breath; that the respiratory murmur may be heard of equable strength, free from the character of puerility on the one hand, or feebleness on the other; that the sound on percussion is equal, without local dulness, or the morbid clearness of dilatation of the cells; that there are no morbid phenomena of voice; and lastly, that the motions and sounds of the heart are tranquil and natural.

Under these circumstances the indications are to change the action of the mucous membrane at the slightest possible risk to the constitution. I have nothing to add to the therapeutic means already so well known; but I shall make a few brief remarks on the various classes of remedies which have been found useful in the disease.

On the subject of revulsives it may be stated, that their employment is generally useful, and that we may thus by perseverance often produce the best effects. The remarks which I have already made on this point will be found to apply in this form of disease, as well as in the second stage of the acute bronchitis.

I have been for some time in the habit of employing a mode of treatment, which I can recommend strongly, not only in this disease, but even in confirmed phthisis. It consists in sponging a large surface of the chest daily with a liniment composed of the spirit of turpentine and acetic acid, so as to keep out an erythematous state of the skin; and I do not know a more easily manageable or efficacious remedy. From numerous observations I have concluded, that this liniment not only acts beneficially, by its counter-irritating properties, but that the ingredients are absorbed by the surface, so as to act on the mucous membrane as direct stimuli. My reasons for this opinion are, that I have seen it to produce effects of the most favourable description, even when but little redness of the surface was produced; the relief being much more than could have been expected from the mere amount of counter-irritation. In several cases too the secretion of the kidneys has been increased.*

In addition to this treatment, I have often ordered the patient to inhale the vapour of water impregnated with a narcotic. Twelve or fifteen grains of the extract of hemlock are diffused in a proper inhaling apparatus, and the vapour drawn into the lungs for a quarter of an hour, once or twice a day.

Many other remedies of the stimulant, tonic, astringent, and sedative classes are found useful in this disease. I shall allude briefly to those of whose efficacy there appears good evidence.

Among the most efficacious of the stimulants the terebenthinate preparations stand prominent. The various balsams, exhibited, either alone, or in combination with a sedative and tonic, often act well; and next to them we have the gum resins, such as ammoniac and myrrh. From the efficacy of strychnine in the analogous affection of the digestive mucous membrane, there seems good reason to hope, that in the pulmonary disease it would prove useful. Its remarkable power too, of stimulating the muscular tissue to contract, may be found of great utility in many chest affections; and we might hope that effects would be produced similar to those of galvanism in asthma in the hands of Dr. Philip, or in chronic mucous catarrh, as stated by Dr. Forbes. The tonics which may be often employed when the powers of life are low, and particularly in cases where a strict antiphlogistic system has been pursued, are principally the preparations of quinine and iron. Of the utility of both these remedies I have seen many examples. The combination of the myrrh and iron mixture with the laurel water has been a favourite with me in such cases for a length of time.

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* The following is the formula which I employ:

℞. Sp. Terebinth. ℥iii. Acid. Acet. ℥ss. Vitell. Ovi. i. Aq. Rosar. ℥iiss. Ol. Limon. ʒi. m.

I have very seldom employed the directly astringent substances in this disease. But in cases where the flux is excessive there seems reason for their cautious exhibition. From the great powers and safety of the acetate of lead, I would prefer it to most others; and there is abundant evidence in favour of its astringent action on the capillaries of the lung. Thus in the passive bronchial hæmorrhage nothing can be more striking than its powers over the disease; and on the continent it has been exhibited with such great success in cases of chronic puriform expectoration, as to be looked on as a means of curing consumption.

But in cases of super-secretion, unless, from age or disease, the patient be in a state of extreme debility, the emetic plan is always to be preferred to the astringent. There can be no doubt that the emetic class of medicines act most beneficially on the diseased bronchial tubes, and not only get rid of the super-secretion mechanically, but also exert a favourable action on the cause of its production. These remarks apply more particularly to the preparations of antimony and ipecacuan; and it is often excellent practice to administer an emetic frequently in the treatment of a chronic catarrh, where the secretion is superabundant. By this means the tubes are emptied, so that an emetic is often to the lungs what a laxative is to the digestive tube; the air is freely admitted, and the arterialization of the blood, as shewn by the rapid subsidence of lividity, again takes place with freedom; the bronchial muscles are stimulated, and time and opportunity gained for other treatment.

After speaking of cases, in which the use of means, really efficacious, is too soon given up by the practitioner, Laennec says: "Among these means there is no one more frequently useful than emetics, repeated according to the patient's strength, and his power of supporting their action. I have cured in this way catarrhs of very long standing in old persons, and still more in adults, and children. In the case of an old lady of eighty-five, who had laboured under a chronic catarrh for eighteen months, with an expectoration amounting to two pounds daily, I prescribed fifteen emetics in one month, and with complete success, as the patient lived eight years afterwards, free from the complaint." This author further recommends, that after the use of the emetics, tonics should be exhibited, and in this I fully concur.

The latest authority on the use of emetics in this disease is Dr. Giovanni de Vittis, and as his treatment consisted almost entirely in their employment, the results have great interest. In a recent number of the *Annali Universali di Med.* we find that his mode of proceeding is to administer as much of a solution of tartar emetic, in the proportion of half a grain to the ounce, as will produce vomiting. This is repeated morning and evening, and the patients are supported on a farinaceous and milk diet. When it produced too much action on the bowels it was suspended, and grain doses of roasted ipecacuan, with the same quantity of digitalis, were given at short intervals until the diarrhœa ceased.

The author's account of his success, not only in chronic catarrh but in phthisis, is almost too favourable. In all probability many of his cases were only examples of that form of bronchitis to which I have already alluded, where the minuter tubes are engaged, and the disease but little removed from suppurative pneumonia. In such cases, when we consider both the specific and the emetic action of the remedy, I feel certain that the practice is probably the best that could be adopted.

When I speak of the treatment of the secondary bronchitis of typhus I shall return to the subject of emetics in this disease.

The last point of treatment to which I shall allude is the use of the sedative and narcotic medicines. Of these there are few that have not the best effect in the variously modified cases of chronic catarrh. Their use, however, is particularly demanded when the cough is severe, and the expectoration not abundant. We may use the various preparations of opium, hyosciamus, or hemlock; and the combination of these, with a small portion of belladonna, will be found to have excellent effects. I have found the combination of small doses of ipecacuan with hemlock and belladonna to be most useful in a vast number of cases.

We may also use this class of remedies by inhalation. To this I have already alluded.

It has been already shewn that the success of stimulants and tonics, in mucous irritations, depends greatly on the previous employment of an antiphlogistic system. And in the disease before us, we are not to refrain from thus preparing the patient for the specific stimulant merely on account of its chronicity. It is only in cases where there is hectic fever, and that the patient is emaciated, that the above treatment will be hazardous. Yet even here, local depletion, by means of cupping, will often have the best effect.

Finally, we have to consider a point of considerable interest; but it must be confessed, that further and more exact researches are necessary for its elucidation. It is, that the more the disease approximates to a parenchymatous affection, the less will be the influence of the stimulating treatment. In these cases there exists a condition closely approaching to chronic pneumonia or tubercle. The respiration is supplanted by a fine muco-crepitating rale, and there is a degree of dulness on percussion, circumstances which point out that the minuter tubes are engaged. In such cases, and particularly when the above signs were partial, I have often found that after the failure of a stimulating treatment, the disease yielded to an antiphlogistic one; on the other hand, my observations lead me conclude, that the more the disease predominates in the larger tubes the sooner may we have recourse to the stimulating treatment. It seems as if the insufficiency of mere antiphlogosis, for the removal of disease, is most evident in the vascular tissues, such as the skin and the mucous membranes, properly so called. And hence we may understand why one principle of treatment applies more to the disease of the large tubes, and another apparently to that of the minuter ramifications.

Treatment of Secondary Bronchitis.—In discussing this part of our subject I shall merely speak of the treatment of the disease as occurring in typhus fever. For although there can be little doubt that its existence, under other morbid conditions of the system, will be found to require special modifications of practice, yet as this field is but little explored, I refrain from entering it, as it is much better, in a work like this, to dwell on points which are ascertained with greater certainty.

Now, although the principles of treatment in the catarrh of typhus, are the same as in the idiopathic disease, yet in their application to practice, certain variations are to be attended to. These may be stated as follows:

First. That the antiphlogistic treatment is not to be employed so boldly nor so long.

Second. That the stimulating treatment may be resorted to at an earlier period, and with much greater boldness.

Third. That the use of blisters may be employed also at an earlier period.

Fourth. That as a general rule we are not to expect so much from internal remedies, as in the idiopathic affection. The cause of this is often the complication with abdominal disease.

The employment of the lancet in this disease requires great caution. Indeed for many years I never had recourse to it, but contented myself with the use of local bleeding; more lately, however, I have used the lancet in a few cases, with advantage, and certainly without injury. In these instances the disease existed in young, and extremely robust subjects, was in its early stage, not exasperated by neglect, or modified by bad treatment. But when it occurs in the advanced stages of a low typhoid fever, with stupor, lividity, and prostration, the lancet is to be avoided, and we are to trust principally to local depletion. Indeed, in both these cases, it is from local depletion, and particularly by cupping, that the patient seems to derive the greatest relief. In bad cases I commence by cupping on both sides of the chest, and the depletions are afterwards repeated in different situations, according to the stethoscopic signs of predominance of disease. Should the belly be tympanitic, a fœtid and turpentine enema is to be employed, the operation of which will be followed by great relief to the respiratory symptoms.

These measures having heen pursued, we may at once apply blisters to the chest; and I may remark, that I have always found that their application between the scapulæ or to the sides, gave more relief than to the front of the chest. If the patient, however, be much prostrated, and lying on the back, it is better to apply them to the sides, or anterior portion. As a general rule it may be stated, that the lower the patient be, and the cooler the skin, the sooner may we employ this treatment, which, as well as the cupping, will require to be repeated frequently in most cases.

It is of the greatest importance to attend to the strength of these patients; and it will not unfrequently happen, that we must administer wine and nourishing broths, while we are depleting the congested lung.

The question, as to the best internal treatment in this disease, is still somewhat uncertain. I have employed both the mercurial and antimonial plans in a vast number of instances, and the result of my experience leads me to conclude, that where there is a decided complication with enteric inflammation, it is better to use the mercurial preparations, so as slightly to affect the gums, and then at once to have recourse to the stimulants, such as the polygala, with carb. ammonia, or others of that class. On the other hand, where the digestive system is free, I have little hesitation in recommending the antimonial treatment, even in advanced stages of typhus, and its exhibition for a time varying from a day to three or four days, will often bring the disease under the control of the stimulating treatment. That the tartar emetic may be used without injury, even in the advanced stages of fever, has been satisfactorily established by my colleague, who has successfully employed it in combination with opium, for the removal of nervous delirium and restlessness. To this subject I shall return, when speaking of the treatment of the typhoid pneumonia.

Among the stimulants, which we may exhibit after the mercurial or antimonial treatment, I think that the polygala mixture, of which I have already given the formula, and the turpentine emulsion are the most preferable. In one case, where the symptoms were apparently hopeless, the latter remedy had a most surprising effect.

It is of the utmost importance to preserve a warm state of the surface, and promote the insensible perspiration; and hence I order all my patients, particularly those in hospital, to wear a new flannel shirt next the skin, and have had repeated occasion to observe its good effects. We may use wine freely, particularly when the skin is cool and clammy, and the pulse small, rapid, and compressible, and its good effect will be shewn by this, that while the skin becomes warm, the pulse diminishes in frequency and increases in volume, and these favourable circumstances correspond with improvement in the respiratory symptoms.

Patients labouring under this disease should be as much as possible prevented from lying on their back; they should be turned from side to side, and propped by means of soft pads; and should the stethoscope indicate a decided predominance of disease in either lung, it will be advisable to keep them from lying on that side. The smaller the rales the greater will be the necessity for this precaution.

But it occasionally happens, that notwithstanding all our endeavours, a super-secretion shall come on at an advanced period of the fever, and the patient rapidly fall into a state of imminent suffocation; he then lies on his back, the sputa rattle in his throat, he is nearly insensible, and, if not relieved, must inevitably perish. Under these circumstances, emetics have been strongly recommended by Dr. Mackintosh. But my hopes from the use of these remedies have been so often disappointed, that although I would administer them in all such cases, yet I would estimate the chance of recovery as exceedingly small. The cases in which I have used this practice myself, or seen it employed by others, may be divided as follows:

First. Those in which the action of the emetic was followed by recovery, this is by far the smallest class.

Second. Those in which the emetic produced full vomiting, and the patient appeared, as it were, to be snatched from the jaws of death, so great, and for a time so complete, was the relief produced. Yet in the course of twenty-four or thirty-six hours, the accumulation again recurred, and the situation of the patient was as bad as, or worse than, before. Under these circumstances the emetic may again and again produce its full effect, but at length the disease is triumphant, and a protracted struggle closes this melancholy, and to the thinking physician, most humbling scene. In one of my cases the disease occurred in a young and robust girl, and great relief was given, no less than four times, by the use of emetics, while in the intervals no means that all my ingenuity could devise, were neglected to moderate the disease. But our efforts were in vain, and the patient ultimately sunk with tracheal rattle. On dissection, the whole bronchial system was filled with reddish frothy mucus, and the lining membrane was universally red.

Third. Those in which no vomiting whatever was produced, even by the administration of the most powerful emetics; of these cases I have seen a considerable number. In some the powers of life were certainly much sunk, and the blood in a very unarterialized state; but I have also seen cases where there was still much vigour, and where not the slightest action was produced on the stomach, even by the most powerful emetics. Can this be explained by the doctrine of the physiological school, that the plus vitality or irritation of one organ implies a minus state of others? In such cases I have observed, that no apparent effect either on the pulmonary symptoms, or on the gastro-intestinal system, was produced by the emetic; and I have seen hippo wine, tartar emetic, sulphate of zinc, and sulphate of copper, administered successively to the same patient.

The latest writer on this important subject is Dr. Graves, who has proposed the employment of a combination of tonics and opium in the form of enema, with the intention of checking the superabundant secretion. In the epidemic influenza of 1833, many examples of this suffocative catarrh occurred; and in several of them the administration of an enema, containing ten grains of sulphate of quinine, and twenty drops of laudanum, had, in his hands, the happiest effects. He gives the detail of three cases where the patient was moribund, and in whom life was distinctly saved by this treatment. Before leaving this subject I cannot do better than insert his concluding observations.

"To conclude, I must observe that this form of disease will often baffle the most skilful practitioner, and therefore the remedies I recommend will of course, like all others, frequently fail. An accumulation of mucous secretions in the air passages producing the *rattles*, forms the closing scene of almost all diseases, however different in their nature. To exhibit remedies for this would be ridiculous; it is only when this accumulation is the direct consequence of actual disease attacking the air-passages themselves that we can hope for its removal. In such cases we must try every thing that experience has proved to be even occasionally useful, and must carefully watch the effect of each new medicine, for it must not be concealed that very different results are obtained from the same remedies under circumstances apparently similar. The injection of sulphate of quinine and laudanum possesses, as appears from the cases I have detailed, very great powers, and for that very reason must be used with circumspection, for if exhibited at an improper period of the disease, or in cases where expectoration is at all scanty and difficult, it may produce dangerous consequences."

We have now examined into the history of the primary and secondary forms of bronchitis, but it must be considered in a different point of view, namely, as a complication with other diseases of the thoracic viscera. It is obvious, however, that were we now to examine the complications of the various diseases of the heart and lungs with bronchitis, we should feel a difficulty from not having yet investigated these subjects alone. And hence it will be better to describe the complication with bronchitis in the separate affections as they come before us.

ORGANIC CHANGES OF THE TUBES AND AIR CELLS CONSIDERED IN RELATION TO BRONCHITIS.

These may be enumerated as follows:

First. Narrowing of the calibre; obliteration.

Second. Dilatation of the tubes.

Third. Ulcerative destruction of the tubes.

Fourth. Enlargement of the air cells.

Fifth. Atrophy of the lung.

Before proceeding to examine these lesions I must premise, that I do not contend for their inflammatory origin in every case. I do not deny that a process, different from the inflammatory, may produce obliteration or dilatation of the tubes or air cells; but when we look at the whole subject, these instances seem to form the exception to a general rule, and the great amount of evidence goes to shew that the connexion between these lesions and an inflammatory process is seen in a vast majority of cases.

It will be necessary here to take a brief view of the structure of the lung, as connected with the bronchial tubes. The views of Malpighi, subsequently confirmed by Reissessen*, and more lately established by Reynaud,† must be now adopted. Indeed the opinions of Helvetius, Haller, and others, which held that at the termination of the bronchi they ceased to exist as ramifying tubes, but were lost in a spongy tissue, whose cells communicated in all directions, were not only at variance with accurate anatomy, but opposed to that analogy of structure which Müller has shewn to exist in all glandular organs, among which the lung, from its structure and functions, must be classed, and the coincidence between two such anatomists as Reissessen and Müller, each on a separate path of investigation, was all that was wanting to set the question at rest.

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* De Fabrica Pulmonum, a Reg. Acad. Scient. præm. ornat. Berolini, 1822.

† Memoires de l'Academie Royale de Medecine, tom. iv. 1835.

This structure, so far as the air tubes or excretory ducts of the gland are concerned, may be stated to be, that there is a progressive subdivision of the bronchial canals until their ultimate ramifications terminate in culs de sac, which we call the air cells. Thus, the tubes continually subdivide, but never anastomose.*

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* As the work of Reissessen is but little studied in this country, I shall give his conclusions on this subject in his own words. After detailing the experiments on which his opinions are founded, he adds:

1. "Fistula igitur spiritalis in ramos dividitur certa constantissimaque ratione et diametro decrescentes et numero augescentes, usque dum coecis terminetur finibus iisdemque rotunde clausis.

2. "Nec ideo in telam cellulosam abit hujusve naturam recipit, sed propriam ipsius fabricam ad extremos usque fines servat, quibus ut dixi clausis, cellulas refert, sive vesiculas aëriferas.

3. "Cartilaginea tantum persistit, quoadusque fabricæ subtilitas cartilaginem fert, deinde membranacea excurrit." Op. Cit. p. xi.

I shall also subjoin the observations of M. Reynaud.

"I have repeatedly examined the lungs of the fœtus that had not respired, and on passing mercury into the tubes, if I found very fine lobules at the edge of the inferior lobe, I could distinctly see a fine air tube entering them, dividing necessarily into many branches, each of which again subdivided in the same manner, and so on repeatedly. These divisions, shortening and diminishing in diameter, terminated by becoming pitted, as if a vast number of little cul de sacs, or depressions, arose from their sides, and their extremities were rounded and closed. Beyond this point the mercury could not penetrate. It presented a perfectly regular arborescent form, whose terminal ramifications had no lateral connexion, as proved by the fact, that even when these ramifications were pressed close to one another no admixture of the mercury took place. When the quicksilver was pressed into one of the minute tubes, the fine bronchial tree could be seen forming before the eye. And what proved that these canals, through which the mercury had penetrated, really pre-existed, was, that on removing the pressure the mercury retired, again to return to its previous position. But on its reaching its final termination it could be forced no farther, nor did the pressure employed cause any of the minute terminal globules to be confounded.

Although I have not made any observations on the normal structure of the lung, which could confirm or shake this doctrine, yet I have been convinced, from the examination of morbid parts, that the views of Malpighi and Reissessen are correct. To this point we shall just now return, when I shall describe a singular variety of pneumonia, since noticed by Reynaud, which gives a beautiful demonstration of the pulmonary structure, and the relation of the air cells to the tubes.

NARROWING AND OBLITERATION OF THE BRONCHIAL TUBES.

Hitherto the diminution in capacity, and obliteration of the bronchial tubes, have been merely noticed as curious points of pathological anatomy, and it was reserved for M. Reynaud to

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"In many other instances, even where I employed no injection, or any other preparation whatever, I have seen the same disposition in the adult lung of animals and man, whose bronchial terminations are much larger than in the fœtus. In a portion of the lung of an ape, which I removed from the anterior edge of the organ, and dried upon glass, so that the air was continued in its last bronchial ramifications, the disposition above described could be most plainly seen.

"What prevents us observing so easily this mode of termination of the bronchial tubes in the recent human lung is, that the last ramifications terminate perpendicularly to the pleura, from which we can only see their terminal cul de sacs, and the trunks from which these have been derived. In a considerable number of lungs, however, I have observed, that in certain points of their surface there existed a curious disposition, which allowed me to observe the trajet of several bronchial ramifications through the pleura. From some cause, which I cannot explain, a certain number of tubes, longer than the others, had not the pleura for their limit, but having arrived at that membrane, in place of terminating perpendicularly to it, they turned and ran parallel to it for a distance varying from two to five lines, or upwards. Under these circumstances, the air contained in them, like the mercury, as above stated, formed a perfectly regular tree, the arborescent form of which was continued to a point, beyond which pressure could no longer force it, and which obviously shewed the termination of the tree."—*Memoires de l'Acad. Royale de Medecine*, tom. iv. Fas. 11. The same author adds a confirmatory dissection, which it is unnecessary to insert here.

call the attention of pathologists more especially to this most important lesion. Yet even this distinguished physician goes little farther than to describe the various species of obliteration, declaring that as yet he is ignorant of its symptoms, and even in doubt as to its causes. To me it appears that there can be little question as to its cause in the great majority of instances, and that to its existence we are to attribute many hitherto unexplained auscultatory phenomena, of importance, not only in the diagnosis of bronchitis, but more especially in that of the early stages of pulmonary consumption.

It is obvious that when inflammatory action seizes on a bronchial tube, its effect, considered anatomically, will vary according to the diameter of the canal. In the larger tubes, whose parietes are guarded with strong cartilaginous plates, nothing but a great local hypertrophy of the mucous membrane could cause an obliteration, while in the minuter tubes, whose perviousness is not so provided for, the same process would much sooner produce obliteration.

Indeed, in the diseases of what may be called tubular organs, experience shews, that when we can compare canals of different diameters, as, for instance, in the circulating system, the liability to obliteration is directly as the smallness of the tube. We accordingly find that in the lung it is the minuter tubes which are commonly the seat of the obliterating process, and when we reflect on the frequency of pulmonary irritations, and the extreme minuteness of the ultimate ramifications of the tubes, it seems strange indeed, that the lesion does not more often occur. It is obvious, however, that in the respiratory motions, both of inspiration and expiration, but particularly the first, there is an important provision against the obliteration of the air passages while in a state of disease.

But the subject must be considered in another point of view, namely, as connected with original structural differences in the lining membrane of the large tubes and smaller ramifications. It seems now established, that in following the bronchial ramifications, from their origin to the pleura, we may observe, if not a complete transformation from mucous to serous membrane, at least a decided tendency to it, which increases as we approach their terminations. In the larger tubes we find a vascular mucous membrane, endowed with villosities and glands, but as we advance into the substance of the lung, this tissue gradually loses its original characters, until at its ultimate point, if it be not completely serous membrane, it closely approaches to it in appearance and function. If we now add these considerations to the preceding, we get at once a sufficient explanation of the point in question. As M. Reynaud remarks, we may expect the plastic inflammation, the more the affected tissue approaches to white structure, and hence another cause of the greater liability of the minute tubes to obliteration.

A diminution of the calibre of the air passages may arise from various causes; among which the following are recognized by pathologists:

First. A thickening of the mucous membrane. This may result from inflammatory turgescence, congestion, or œdema, or be caused by a permanent organic change, in which there is actual hypertrophy of the membrane. These changes are most evident in the affections of the larger tubes.

Second. We observe this change as a result of the secretions of the tube. This is seen either in cases of croup, or of that form of bronchitis in which casts of the tubes are expelled. In the latter instance very large tubes may be affected, so that we can hardly agree with Andral in his opinion, that unless when the larynx in children, or the minute bronchi in them and the adult are engaged, this cause hardly affects the capacity of the tube.

Third. The compression of the tubes by external tumours.

Fourth. The existence of foreign bodies within the tube.

Such are the causes enumerated by Andral; but it is with two first classes that we have at present to do. It is plain, that if any of these causes be carried to a certain point, obliteration of the tube must ensue; but we find that this termination is much more often a result of disease of the interior than of the exterior of the tube.

OBLITERATION OF THE BRONCHI.—In considering the relation of this disease to inflammatory action, we shall first advert to some important points established by M. Reynaud.

If we commence at the termination of the tube or the air cell, and proceed towards the trachea, it is found that obliteration may take place at almost all points of the bronchial tree. I have already alluded to a case by Andral, where the obstruction, which was owing to a local hypertrophy of the mucous membrane, took place only a few lines from the origin of the principal bronchus of the upper lobe. I do not know of any case of obliteration, or even great internal obstruction of the primary divisions of the trachea, but with this exception, the disease has been met with in the remaining portions of the tree.

In all cases, except where the tube was extremely minute, it was found, that just at the commencement of the obliteration a cul de sac existed, beyond which the tube was converted into a solid fibrous cord, furnishing also ramifications which answered to the originally pervious tubes.

In some cases these culs de sac formed dilatations of the tube, a fact principally observed when the larger canals were engaged; while in others, the tube terminated more or less abruptly, without any perceptible dilatation, and was replaced by a solid fibrous cord, which when it sprung from a large tube, could be seen to be conical, gradually diminishing in volume, and traceable near to the surface of the lung, or even under the pleura. In other respects the disposition of these cords was very variable; in some instances their subdivisions were as regular as those of the bronchial tubes themselves, and terminated near the pleura by a vast number of minute filaments; while in others, a single cord passed onwards to the pleura, from the sides of which secondary filaments were seen to emanate.

These observations, it must be borne in mind, apply chiefly to that form of obliteration in which the sides of the tube adhere, without the presence of any foreign matter in their cavity. The condition of the mucous membrane, in the vicinity of the obliteration, was various; in some cases being healthy, in others inflamed.

One of the most interesting points connected with these researches, was the state of the pulmonary tissue and bronchial tubes in the vicinity of the obliteration. In the effects produced on these structures we may see some analogy to the results of obstruction of the arterial system, namely, atrophy, and a collateral circulation. Thus, although proceeding from causes widely different from those alluded to, we find a dilatation of the neighbouring tube and an atrophy of the pulmonary tissue in these cases of obliteration. But it is plain that when we recollect the structure of the lung, we at once see that this dilatation of the neighbouring tubes has no analogy to the collateral circulation in arterial obstruction.

It is found that in the vascular system the circulation can be continued collaterally, or even into the original trunk below the point of obliteration. But as Reynaud well remarks, this can never occur in the case of the bronchial tube, there being no collateral communication between its branches. Hence there is a diminution in the extent of respiratory surface equivalent to the impermeable portion of the organ. But as the inspiratory effort is undiminished, its effect must be to dilate the tubes in the vicinity of the obliteration. According to this view, the dilatation is a purely mechanical process, how far we are to consider it as such in all cases, must be hereafter examined.

As might be expected, those parts of the lung to which the obliterated tubes extend, have been found to present a sunken appearance, so as to cause depression of various depths on the pleural surface. The mechanism of this change is obvious. In the neighbourhood of the obliterated canals, however, the air cells were frequently found dilated, while in other instances, the tissue was dense and impermeable.

It would appear that we may consider this obliteration of the bronchial tubes in two points of view: first, as commencing in the finer, and proceeding by continuity of disease to the larger tubes; and secondly, as the result of obstruction of a large trunk, and the consequent obliteration of the tubes to which it gave birth, by a process similar to that observed in arteries after ligature. Of these species the first is the most frequent and important; and I cannot help thinking that its investigation will not only go far to clear up the long controverted point as to the nature and origin of tubercles, but also throw light on other subjects of thoracic pathology.

M. Reynaud draws a distinction between the cases in which the obliteration has taken place by simple adhesion of the parietes, and those where it is produced by a substance formed and accumulated in their interior. But this distinction seems unnecessary; for if, as I apprehend we shall find to be the case, there is an analogy between these obliterations and those of serous membranes, there seems to be no more reason for this distinction in the former than in the latter case. In inflammations of the pleura or pericardium, &c., we may have the cavity destroyed either by simple adhesion, or with an intervening layer of the products of the inflammation; yet, in either instance, the nature ofthe disease does not seem different. Of course I do not mean to deny, that in certain cases a foreign matter, not the result of the disease of the affected tube, but proceeding from other sources, might, in its trajet, obstruct and obliterate the canal.

This disease has been met with as a chronic, or an acute affection. As a chronic disease it will be frequently found in connexion with tubercle. It is an interesting fact, that it occurs much more frequently in the upper than the inferior portions of the lung, and its connexion with the developement and phenomena of tubercle is too obvious to be overlooked. When discussing the question, as to how far we can distinguish between bronchitis and phthisis, we shall return to this point, and here only remark, that the advance of medicine is strongly tending to shew how artificial many of our distinctions have been.

As yet but very few cases of the disease, in its acute form, have been described. But there can be no question, that this has arisen from the careless mode in which dissections of the lung are commonly made. I have little doubt, that obliteration of the minute tubes occurs in many cases of pulmonary disease; and that thus the pent up secretions of the air cells represent, in some cases, the acute granular tubercle, and in others, where the affection is more general, the suppurative pneumonia.

Thus, in a patient of Louis', who died of pneumo-thorax, after small-pox, numerous tubercles were found throughout the perforated lung. On dissecting the small bronchial tubes which led to them, these canals were found very red, and lined with a firm layer, which filling their cavities, continued to their terterminations, thus giving them a granular appearance. Along their course the blood vessels were black, and the pulmonary tissue of a deep reddish brown colour. There was no hardening of the lung, nor the semi-transparent infiltration, but the entire lung was filled with small cavities containing pus. One of these cavities was lined with a whitish membrane, which was prolonged into the mouth of the bronchus that opened into the cavity. "This plastic material," says the author, "presented the same characters as that contained in the small bronchi, which by their reunion formed those apparently tuberculous masses which we have spoken of above."

With respect to that form of disease, in which it represents the suppurative pneumonia, I have to remark, that in the third volume of the Dublin Medical Journal,* four years before M. Reynaud's memoir appeared, I described a form of pneumonia, at that time unknown, but which since has been noticed by M. Reynaud. Of the nature of this affection I was ignorant, but I now feel no doubt, that it was an example of this "*plastic croup*" of the air cells and minute bronchial tubes, and quite analogous to the case described by the above author.†

A young man entered the Meath Hospital on the 13th of April, 1832, labouring under the usual symptoms of acute pneumonia, which were of three days' standing; the disease was found to occupy the lower lobe of the left lung, which had passed into the stage of hepatization. We employed general and local bleeding, and put him on the use of free doses of calomel and opium. The blood drawn did not present any inflammatory appearance, and although his general symptoms seemed alleviated, yet the stethoscope did not shew any improvement in the condition of the lung. In the course of the third day of his treatment, a violent exacerbation took place, subsequently to which a moist crepitus was heard mixed with the bronchial respiration over the dull portion, and the right lung became affected with a general bronchitis. These circumstances, combined with the fact that no ptyalism whatever had occurred, induced me after two days to make the diagnosis of the third stage of pneumonia. About this time a remarkable change took place in the stethoscopic phenomena. A large rale was heard about the root of the lung, and the bronchial respiration here became so peculiarly modified, that even after repeated examinations I declared to the class, that I could not satisfy myself of its exact nature, and, therefore, could not say whether or not an abscess had formed; the dulness continued.

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* Contributions to Thoracic Pathology. Notice of an hitherto undescribed termination of pneumonia. Op. cit. p. 50.

† Memoires de l'Acad. Royale, &c.

On the seventh day copious sweatings, preceded by rigors, supervened; these continued till the twelfth day from his admission, when he sunk.

On dissection, we found the bronchial mucous membrane universally inflamed, and recent adhesions of the pleura, particularly the left. On removing the left lung, its upper lobe was found crepitating, though engorged, but the lower, when viewed externally, represented a bag of matter, the yellow colour of which was seen plainly through the pulmonary pleura. This being opened, displayed the substance of the lower lobe completely dissected from its pleura, by the suppurative inflammation of the sub-serous cellular membrane. This process also was found to have invaded extensively the inter-lobular and inter-vesicular cellular tissue, so as to cause this part of the lung to represent nearly the structure of a bunch of grapes. All these nearly isolated lobules were surrounded by puriform matter, in which they hung from their bronchial pedicles. There was no air in the cavity thus formed within the pleura, yet external to the lung, nor could I find any evidence of any bronchial communication with it.

At the period of this dissection I was not able to find any description of this termination of pneumonia, and merely remarked that the case was one which might be appealed to by those who hold that the original seat of pneumonia is in the inter-lobular and inter-vesicular cellular tissue, and that the air cells are secondarily affected. Here we found the sub-serous and inter-vesicular tissue extensively suppurated, so as to present a beautiful dissection of the lung, while the pulmonary vesicles were comparatively intact, but remained, as represented by the bunches of granules, immersed in the surrounding puriform matter.

I shall now give an abstract of M. Reynaud's case of the same form of disease.

" A patient, aged 35, died after a rapid acute pneumonia. The left lung was entirely hepatized, the top of the organ alone being free from alterations. On cutting into the lung its tissue was red, interspersed with yellow and black patches. In some portions the colour was uniformly grey, or like that of pus. The organ, covered by a recent yellow false membrane, did not collapse on opening the chest; its density and specific gravity might be compared to that of the liver; it was completely deprived of air, and broke under the finger. By these characters it was easy to recognize the second stage of pneumonia and its passage into the third or suppurative stage. So far the lung presented nothing that could make it distinguishable from other lungs in the stage of red or grey hepatization; but closer attention discovered consistent cylinders projecting from the interior of the bronchi of the second and third order, as is often seen to occur with respect to the discoloured coagula observed in blood-vessels, and for which at first sight these were mistaken. As this matter formed in the interior of the bronchi solid cylinders which penetrated all their divisions, it could be taken out in a very arborescent form, the perfect cast of the bronchial ramification itself. At a short distance from the periphery of the organ these branches of plastic matter still presented the arborescent appearance, and by careful dissection might be followed to the terminal vesicles within half an inch of the pleura, where there appeared on them small lateral swellings, round, regular, at first isolated, afterwards more numerous, so that they appeared festooned on their borders. Some of these projections occurred at only one side, and in this particular instance they gave off other and more numerous bulbs, presenting the appearance of bunches of grapes. A very slight pulling on the principal cord from which they sprung sufficed to remove them without any dissection of the cavities which contained them.

" According as we approached closer to the pleura, the little cylinders, of which we have spoken, became divided into branches, shorter, more numerous, and swollen at their extremity, so as to appear knotty; and immediately under the pleura they appeared in form and colour similar to those granules that are observed in some of the forms of hepatization of the lung, which this patient exhibited in the highest degree.

"This appearance was not only observable on the surface of the lung, but internally and on all the points of the incised surface. All the bronchi that were examined were in the same state as those I have described. The smaller the bronchi were the more full were they; thus in the branches the plastic matter did not occupy two-thirds of their calibre, while their terminations were accurately filled in their whole diameter.

"In its external characters the contained substance resembled fibrine; it was of a slightly yellowish white colour, resisting, elastic, and capable of being separated into filaments. It appeared under the microscope to be composed of a multitude of uncoloured and perfectly round globules, like those of the blood, excepting that in the terminations of the tubes, where it was grey or of a dirty black colour. This matter differed in appearance in those parts of the lung affected with the second and with the third stage of pneumonia. In the latter the filaments were much more moist, less resisting, and thinner, and filled less exactly the cavities of the tubes.

"The bronchial parietes offered nothing remarkable either in colour or thickness; some tore with more facility than would be expected in the healthy state; towards their terminations their colour was similar to the contained matter."

To dwell on the close similarity of these cases would be superfluous; but we might inquire whether this form of disease is not more common than would at first appear. I cannot help thinking that it is to be met with in many, if not all cases of the interstitial suppurative pneumonia, (Laennec's third stage,) and that adventitious circumstances prevent our seeing the peculiar appearance of the bunches of granules. Indeed Andral explains the granular structure of the lung when thus affected, by an enlargement and thickening of the cells; and I have little doubt, that by a process similar to that by which we demonstrate the cellular membrane of the brain, the structure of the lung could also be shewn. I think it will be found if a drop of water be let fall continually on a lung in an advanced stage of pneumonia, that the purulent matter between the minute bronchi and air cells will be washed away, and the above appearance produced.

When we consider the structure and functions of the lung, it seems probable that its minute bronchial tubes, or excretory ducts, might be plugged up by secretions of the cells, independent of inflammation in the parietes either of the tubes or cells. Yet we cannot help looking on the obliteration as principally connected with inflammation. In fact, the preponderance of the latter process, in the vast majority of internal diseases, gives alone a great probability that the lesion in question is one of its results. But when we find it occurring in an organ and tissue, of all others the most liable to this action; when we recollect that the adhesive process is always preceded by increased action; when we see this most evident in that part of the tube in which the white tissues are predominant, and perfectly analogous to the same process in serous inflammations; when we observe so close a resemblance between this disease and the inflammations of other tubular organs, such as arteries, veins, and lymphatics; when we find it in most cases occurring with other signs of chronic irritation of the lung, as in phthisis, or as a distinct result of acute inflammation, we cannot avoid coming to the conclusion, that it is a frequent and most important result of bronchitis; and that before we can consider the diagnosis and pathology of this disease as established, its phenomena must be studied with reference to the obliteration of the minute tubes.

I need hardly say, that the diagnosis of this lesion is still to be investigated. But although not possessing any particular observations on the point, we may, to a certain degree, anticipate its signs. They will of course depend on various circumstances, such as the number of tubes affected, the state of the air cells, and so on. If but a few tubes are affected, it is probable that no perceptible physical sign would be produced; but if the contrary, then we would have a proportional feebleness of respiration. Under these circumstances, if the air cells continued unaffected, or but little engaged, the sound on percussion would be clear, and thus would be produced a combination of phenomena, commonly found in the earlier stages of phthisis.

On the other hand, if a great number of the terminal ramifications, or cells, became plugged up by their own secretions, the combination of feebleness of respiration with a degree of dulness would be produced; and this combination, as every one knows, is the most common sign of incipient phthisis; and the similarity is completed when we recollect that the seat of tubercle and obliterated bronchi is most often the upper lobes of the lung. Indeed there can be little doubt, that we have been long observing the physical signs of phthisis under a false idea of their nature, and that many of them, at least, are to be attributed to this lesion. When I come to the subjects of pneumonia and phthisis, this point shall be again brought before the reader; and I shall examine whether the lines of distinction, which have been drawn between these affections, are in all cases so well defined as some pathologists have supposed.

DILATATION OF THE BRONCHIAL TUBES.

I have already, when speaking of obliteration of the tubes, alluded to the analogy between that disease and affections of the circulating system. Thus, in the obliteration by adhesion, in the plugging up by the results of morbid secretion, in the atrophy of the parts of the tube beyond the obstruction, and in its reduction to a solid fibrous cord, we see circumstances common to disease both of the bronchial tubes, and the arteries in general. We might also extend this analogy to the case of dilatation of these canals, and trace a resemblance between the bronchial and arterial diseases. In both we may see dilatation, either partial or more general; in both there is a loss of elasticity, produced in most instances by chronic inflammation, and allowing of enlargement of the canal by the action of the fluid which passes through it. Further, we see in either case obliteration of the smaller trunks in the vicinity of the diseased tube, while in other instances they are pervious even when springing from the dilated portion; and we observe compression and atrophy of the surrounding parts. In these observations I only allude to the true aneurism; although I think it not improbable that the false aneurism of the bronchial tubes may yet be discovered.

Authors have described various forms of this disease, which in general terms are reducible to three varieties: first, that in which the tube is continuously dilated, so as to be nearly the same diameter at its termination as its commencement. When this disease is general, and that we lay open the bronchial system, the tubes present the appearance of the fingers of a glove. In the next variety, we may have a series of dilatations in the course of a single tube, an appearance which has been well compared by Laennec to the common bladder-wrack, (*fucus vesiculosus.*) And lastly, a bronchial tube may be dilated into one large cavity, which gives the signs of, and is often with difficulty distinguished from, a phthisical abscess. As yet but little is known of the causes which determine these different forms.

But a more important division is that which is based on the existence or absence of inflammatory action in the tissue itself. In some cases decided marks of chronic inflammation are found, such as thickening, ulceration, opacity, puriform secretion, and so on; while in others, the tubes are found thinned, so as to become almost transparent. It is not improbable, but that in the first of these cases the dilatation is owing to a long-continued morbid action in the affected portion of the tube itself, which, while it has hypertrophied the tunics, has destroyed their tonicity, while that in the other case, the dilatation will be found to be passive, and produced not so much by disease of the tube itself, as by the obliteration of other canals, which, as Reynaud has shewn, in consequence of the respiratory effort continuing the same, is a powerful cause of dilatation of the unaffected tubes. At the same time we must admit, that a process, similar to that of the softening and thinning of the stomach might also occur in the bronchial tubes, and thus produce a dilatation independent of increased nutrition or vascular action.

The explanations that have been given as to the cause of this disease are, to a certain degree, various; Laennec held, that the dilatation was produced by the stasis of a large sputum in the tube, which, from its frequent repetition, ultimately produced enlargement. But this explanation has been considered too mechanical by subsequent authors. Thus Andral* declares, that it must be referred to some vital action of the parts, and Roche† and Williams‡ to inflammation, which, by diminishing the cohesion of the tissues, causes them to yield to the impressions of respiration and cough.

In examining this question, we should begin with recollecting the tissues which form the bronchial tubes. These are mucous membrane, cellular tissue, cartilaginous plates, and the two orders of fibres, first accurately investigated by Reissessen, the one longitudinal, and the other circular. Now, if the views of this author, as to the muscularity of the lung, be correct, and that they are so seems admitted, we may divide the bronchial structures into the non-muscular, and the muscular layers. Among the first are to be enumerated the cartilaginous plates, and also those longitudinal fibres, which he has shewn to be analogous to the elastic coat of arteries; and in the second, we have the circular fibres, which are to be considered as muscular. If we now study the effects of irritation on each of these classes of tissues, we find that on the non-muscular it produces loss of elasticity, as is observed in the case of arteries, causing their aneurismal dilatation; and in this way we can understand the enlargement of the bronchial tubes, by the repeated impulsion of respiration and cough.

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* Clinique Medicale, tom. ii.

† Dictionnaire de Medicine et de Chirurgie, Art. Bronchite.

‡ Cyclopædia of Practical Medicine.

But another cause may exist, and it is one as yet not alluded to by any author, I mean a paralysis of the muscular structure itself, the result of the inflammatory action; and which, like the paralysis of the intestine in enteritis, or ileus, is followed by a dilatation of the tube. Dr. Abercrombie has shewn, that ileus may occur without mechanical obstruction; that the dilatation of the tube may be referred to a lesion of the muscular apparatus itself;* and further, that the collapsed parts are almost invariably found healthy at all periods of the disease, the morbid appearances being confined to the distended portions.

There can be no doubt of the fact, no matter how we explain it, that where muscular structures are in close connexion with other tissues which are inflamed, their functions suffer, and we observe, first, an increase of innervation, as shewn by pains and spasms, and next a paralysis, more or less complete. When we come to speak of empyema, diaphragmitis, and inflammation of the heart, we shall see of what importance these considerations are. At present it appears that we may hope to elucidate some points in the symptoms and treatment of bronchitis by having recourse to this view. May not this paralysis explain the difficulty of expectoration in certain cases; the stasis of matters in the tubes, and the liability to asphyxia in bad catarrhal fevers? And we might further inquire, how far its existence should lead us to modify our treatment, and seek for some agent which would stimulate the bronchial muscles to contract. Abercrombie relates a case of distention of the bowels, in which galvanism had the best effect; and I have already alluded to the use of the same agent in pulmonary disease by Drs. Philip and Forbes. Now, as the lung derives a large portion of its nervous supply from the cerebro-spinal system, we might hope, by the exhibition of such remedies as strychnine, to act beneficially upon it when its innervation was injured.

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* Diseases of the Stomach and Abdominal Viscera, p. 185.

There remains for examination another interesting point connected with this subject. It has been shewn by Purkinje and Valentin*, that the vibratory motions produced by cilia on the surfaces of many of the invertebrated animals and reptiles, is a phenomenon common to the respiratory and generative mucous membranes of the warm-blooded animals. These motions were first observed by Steinbuch† in the larvæ of the Batrachian reptiles more than thirty years ago, and since, it may be said, re-discovered by Dr. Sharpey of Edinburgh, who, in a paper published in 1830,‡ pointed out the existence of the motion in question in the larva of the frog and salamander, in most of the tribes of mollusca, and in the annelida and actinia. He endeavours to prove that it was a provision extensively present among aquatic animals, serving chiefly to maintain a flow of water along the surface of their respiratory organs, but in some cases also to convey food to the animal, discharge the ova, or assist in locomotion. According to this physiologist, the characters of the motion were, first, that the fluid was moved along the surface of the parts in a determinate direction; second, that the impelling power resided in the surface over which the fluid was conveyed, which in all instances, as subsequent observations proved, is covered with moving cilia; and lastly, that it continued for some time in detached portions of the tissue, the impulsion of the fluid taking place in the same direction as before the separation of the parts.

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* Müller's Archiv. für Anatomie, No. V. 1834. See also Dublin Medical and Chemical Journal, May, 1835.

† Analecten neuer Beobachtungen und Untersuchungen für die Naturkunde. Fürth, 1802.

‡ Edin. Med. and Surg. Journal, vol. xxxiv.

In a subsequent paper* Dr. Sharpey has published some additional observations on this subject, and states several facts, in which he had been anticipated by previous observers; thus illustrating what has been the case in many instances, that our most useful discoveries have resulted from the observations of more than one individual, and may be justly termed progressive. It would be improper, in a work like this, to enter into any lengthened details; let it suffice to state, that according to the experiments of Purkinje and Valentin, this vibratory motion occurs only in two systems of organs, namely those of respiration and generation; and that, in the latter case, it has been observed only in the female. All parts of the internal surface of these organs in mammalia, birds, and reptiles present this action, which as yet has not been found in any part of the intestinal canal of vertebrated animals. It has been demonstrated on the mucous membrane of the respiratory passages, from its commencement to its termination,—over the whole lining membrane of the windpipe and its branches, even to the smallest divisions which admit of investigation. It is also conspicuous in the nose, but no trace of it can be discovered in the lining membrane of the mouth, pharynx, glottis, or its ligaments. These observations have been lately confirmed by Dr. Sharpey, who has not only demonstrated the existence of the ciliary motion in mammalia, birds, and perfect reptiles, but has shewn in certain cases, the direction in which matters are impelled along the surface, in consequence of these vibrations.†

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* Edinburgh New Philosophical Journal, July, 1835.

† Account of the Discovery by Purkinje and Valentin of the Ciliary Motions, &c., by Wm. Sharpey, M. D. Ibid.

It is probable that we have not as yet learned all the uses of these ciliary vibrations, but that they possess a power of impelling matters along their surface, seems established. "Although," say M. M. Purkinje and Valentin, "the vibratory motion is to be regarded more as a general morphological phenomenon, yet we cannot entirely overlook its particular uses. For by its means the secretions of those mucous membranes on which it occurs, may be conveyed onwards, and many singular phenomena may be accounted for in this way. Thus, for instance, when the bronchial mucus accumulates during a long uninterrupted sleep, and is afterwards discharged, we do not bring it up from the interior of the lungs, but only from the larynx, or top of the windpipe; but we refrain from pointing out further applications, that we may avoid the field of mere hypothesis, which is here so tempting."

Without entering farther into this subject, we may remark, that the pathology of bronchitis and of pulmonary disease in general, must be studied with reference to these motions. We can understand, as connected with the subject of dilatation of the tube, how, by allowing of the stasis of secretion, a paralysis of the circular muscles may be followed by the disease; and if this be true, may not the same occur with respect to these vibratory cilia? May not their action be at first increased, and afterwards destroyed by inflammation, or may they not, under certain circumstances, acquire an undue development? Reynaud has described a condition of the bronchial membrane in a patient who had long laboured under catarrh, where it presented numerous villosities standing out from its surface, so as to give the idea, that aliments would have been digested had they been laid on its surface.

We have now taken a view of the possible causes of the lesion, and have seen that it depends in most cases on a morbid action, generally inflammatory, which, while it hypertrophies the tissues, permits them to yield to forces, against which, in their healthy state, they have various natural provisions.

In others, it may be the result of atrophy; and in a third order perhaps, it proceeds from causes, which, as far as the dilated tube is concerned, are purely mechanical, such as the obliteration of other tubes, or violent cough from an irritation, existing elsewhere.

In examining into the history of the disease, we find that it may occur at all ages, from two months upwards. Guersent is of opinion that it is occasionally congenital, and a predisposing cause of pulmonary disease.* With respect to the important inquiry as to duration of disease, we may divide the cases into three classes. In the first, we find that dilatation may occur to a great extent in a comparatively short time. This has been principally observed in young children affected with hooping cough, in whom the period of two or three months is sufficient to produce the fullest development of the disease. On considering the circumstances of these cases it is plain, that every thing is combined which could bring about such a result. There is a bronchial irritation, accompanied by violent cough, and this occurring at a period of life when the tissues are still imperfect, and the muscular apparatus not yet fully developed, is so powerful a cause, that it seems only wonderful that the lesion does not more often occur.

In the next class, we may place those cases in which a bronchial irritation has continued for many years, in certain cases, indeed for the greater part of the life of the individual. Thus, in three cases of this description, given by Laennec, the duration of the disease was fifty, forty-one, and twenty years. In a case which I observed it had lasted forty years. Andral relates cases of four, five, and six years' duration, and other authors detail similar instances.

Lastly, we have this lesion as a common accompaniment of the tuberculous disease of the lung. Here the period of duration is of course various. Whether the dilatation proceeds from the obliteration of other tubes, as noticed by Reynaud, or is a result of the accompanying bronchitis of phthisis, and assisted by the passage of the secretions and cavities, remains to be determined, but most probably it will be found that all these causes act. It would be an interesting point of inquiry to ascertain how far the emaciation of viscera, which we see so commonly in phthisis, may predispose to this lesion. May there not be a condition of the tubes and their muscular fibres, analogous to that of the heart and stomach; a state of atrophy, highly favourable for the occurrence of passive dilatation.

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* Dict. de Medicine, Art. Coqueluche, tome vi.

We may next consider the nature and amount of the expectoration. It need scarcely be stated, that in a disease occurring under such different circumstances, there is no characteristic expectoration, and accordingly the various forms of mucous, muco-serous, muco-purulent, and purulent secretions, have been met with. The sputa may be fœtid and nummular, and hæmoptysis may occur, even in cases without tubercle.

A more important inquiry is that relating to the quantity of the secretion, the more especially as Laennec has dwelt strongly on this point in speaking of the causes of the disease. Now without denying the influence of a superabundant secretion in producing this disease, yet we must admit it as a cause which is not constant, and even by itself incompetent for the effect. Dilatation has been met with where the secretion has been scanty, or even wanting, and an abundant expectoration may occur without the lesion in question. We must then seek for other causes which may assist in the production of the disease. To some of these I have already alluded, and future investigations must determine how far in addition to the chronicity, violent cough, and abundant expectoration, described by Laennec, the organic changes resulting from hypertrophy or inflammation of Andral, or the mechanical dilatation consequent on the obliteration of other tubes, which Reynaud has shewn to be perhaps the most common cause, other circumstances may act. And it seems highly probable that among these we shall yet reckon the loss of tonicity of the longitudinal fibres, and the paralysis of the circular muscles of Reissessen, and even of the cilia of Purkinje and Valentin.

This disease is met with uncomplicated or combined with other affections, particularly tubercle: we have the authority of Laennec for stating that its most ordinary seat is in the upper lobe of the lung, although it may exist in every portion of the organ, a fact strongly bearing on its connexion both with obliteration of the minute tubes and tubercle. Indeed in most of the cases where it has occurred in the inferior portions, its first seat seems to have been above, as shewn by the greater amount of the lesion. Andral, however, details one case, in which the dilatation existed in the middle lobe of the right lung; but even here a calculous concretion was found in the upper portion. With this latter affection it is commonly combined; indeed I do not remember a single instance where I have found pulmonary calculi without a corresponding bronchial dilatation. We shall see hereafter how strongly this bears on the subject of tuberculous disease.

But there is another combination which has not been sufficiently noticed, namely, that with dilatation of the air cells, the vesicular emphysema of Laennec, of which the following is a remarkable example. A man, aged 40, was admitted into the Meath Hospital, labouring under the symptoms of chronic bronchitis, with paroxysms of orthopnœa, and with copious expectoration of masses of a yellow colour, flowing together like the white of eggs. He stated that he had been subject to an asthmatic cough since boyhood. It was observed that he constantly lay on the left side, which presented nothing remarkable in form, but the right was singularly convex, particularly on its anterior portion, where a remarkable prominence existed, extending from the middle of the third to that of the seventh rib. On percussion, the right side sounded morbidly clear, but the respiratory murmur was generally feeble, and over the whole thorax nearly replaced by a sibilous rale; the heart's impulse was strong, and felt over the anterior portion of the right side, and with violent pulsation at the ensiform cartilage.

This case, which was sent in as an example of hydrothorax, we considered to be one of Laennec's emphysema, with severe bronchitis and hypertrophy of the heart. After he had remained in hospital some time we observed that the postero-inferior portion of the left side was dull, and that over this side considerable resonance of the voice, though not amounting to pectoriloquism, could be heard. Soon after this the patient sunk.

On dissection the lungs did not collapse, but appeared firmly bound down by adhesions so universal, that the cavities of the pleuræ were completely obliterated. In both lungs the lobes were united, but this union must have been the consequence of recent inflammation, as the coagulable lymph thrown out was soft, and the interlobular pleura beautifully injected with red vessels. The adhesions between the pulmonary and costal pleuræ, on the contrary, appeared to be the consequence of a former affection, as they were exceedingly strong, and on the antero-superior part of the right lung the membranes were converted into a thick, white, and cartilaginous substance. The whole of the right lung was in a state of emphysema, all the air cells appearing dilated, and the pleura raised in many places into vesicles the size of a walnut; when cut into, these vesicles were found divided by membranous septa, perpendicular to the surface of the lung. The volume of this lung was double that of the left, its bronchial tubes filled with muco-purulent fluid, and their lining membrane of a bright red colour. The left lung was much diminished in size; the upper part covered with large vesicles, the lower of a pale colour and flabby consistence, but still presenting the dilated air cells. Upon cutting into this portion of the lung, we thought the knife had entered an abscess, as a large quantity of a viscid and yellowish fluid flowed out, and displayed a cavity in the pulmonary tissue, capable of containing a moderately sized apple; but on closer examination this cavity proved to be an enormously dilated bronchial tube, as it was lined by a delicate mucous membrane continuous with that of the bronchial tubes, and beneath which traces of the cartilaginous rings, peculiar to these canals, could be observed. All the bronchial tubes on this side were more or less affected, so that the lung appeared to contain many small abscesses. Posteriorly the pulmonary tissue was of a dark grey colour and cartilaginous hardness, evidently the product of former inflammation. In the immediate neighbourhood of the dilated tubes, however, it was solid, but of a red colour and soft consistence, the consequence of more recent inflammation; the heart was more than twice its natural size, the right ventricle greatly enlarged and thickened, the left thickened without alteration of its capacity, Dilatation of the auricles; no disease of the valves; aorta healthy.

I have inserted this case as it illustrates some interesting points in the history of the disease. It shews that in the same subject a chronic bronchitis may produce very different effects upon each lung; thus in the right lung the lesion was essentially a dilatation of the air cells, the bronchial tubes being scarcely, if at all, affected, while in the left the very reverse had occurred; and the bronchial tubes were so dilated as to represent pulmonary abscesses. It is difficult indeed to conjecture as to the progress of disease in this patient. It seems probable, from the occurrence of the sub-pleural vesicles, that a degree of dilatation of the air cells in the left lung had once existed; in other words, that the state of the air cells in both lungs was, at one time, similar, but that from some cause the bronchial tubes in the left entered into a separate pathological condition, and by their gradual but extreme dilatation produced a real atrophy of the lung. That the lung was actually atrophied was shewn by the fact, that its absolute size was diminished, a diminution which appeared more remarkable when the organ was contrasted with the right lung, and fully explained the remarkable difference of size of either side of the chest, observed during the life of the patient.

In discussing the diagnosis of this affection it must be admitted, that it is surrounded with difficulties, inasmuch as there is no point of absolute difference between its symptoms and physical signs, and those of other diseases, in which cavities are formed in the lung. We see it occurring at all ages, with a great variety of symptoms, whether we consider the constitutional suffering or the secretions of the lung, and producing changes whose physical signs are commonly identical with those of ulcerous cavities communicating with the bronchial tubes. Further, it is to be recollected, that more or less of the lesion is to be met with in many of the chronic diseases of the lung, so that it is only when it becomes excessive and prominent that its separate diagnosis will be called for. Now as the symptoms and signs consist of cough, expectoration, and indications of cavities, it is plain that in most cases the question will be between this disease and phthisis.

Before entering further into the diagnosis, let us recollect the changes produced in this disease. These are, first, a continuous dilatation, next a succession of local dilatations, and thirdly, a great enlargement of a tube, so as to represent a pulmonary abscess. Now it is plain, that these lesions must give different physical signs: with those of the first we are, as yet, not sufficiently acquainted. In all probability they will be found to consist in an extensive bronchial respiration without the dulness of solidification, and a strong but diffused resonance of the voice. This form of the lesion will not present the signs of excavations containing fluid, and communicating with the bronchi, and hence will be less likely to be confounded with phthisis.

In considering the diagnosis of the latter varieties, it cannot be denied that it is one of great difficulty; yet the subject is full of interest, as we here first meet with an illustration of one of these fundamental principles of physical diagnosis to which

I have briefly alluded in the first section of this work, I mean that of successive observation. But previous to our entering on the physical signs, let us inquire whether the constitutional symptoms can guide us in distinguishing the disease from phthisis.

To him who has only studied the subject of phthisis in books, or whose actual experience is limited, it would appear an easy matter to draw the line. But in truth, the tuberculous disease is so protean an affection, that comparatively little value is to be placed in the absence of any of its more characteristic symptoms. The advance of medicine has shewn that this diagnosis is not so easy as Laennec conceived it to be; and that cases will occur in which, in the present state of our knowledge, it is difficult, if not impossible, to avoid error. The absence of the constitutional symptoms of phthisis, and the long duration of the affection, are the points principally relied on; but we find that any of these symptoms may be absent in true phthisis; that this affection may last for many years; and that cases, which seem to have been nothing but bronchitis for years together, terminate by tuberculization and ulceration of the lung. On the other hand, there is no symptom of phthisis which may not occur in dilatation of the tubes; pain, hæmoptysis, cough, all varieties of expectoration, fever, emaciation, atrophy of the lung, &c.

I do not mean to say, that these symptoms are of as common occurrence in dilatation of the tubes as in phthisis; such a statement would be far from the truth, but that they may occur is certain; and hence, the absence of the usual symptoms of phthisis will not assist us in all cases. The same remark applies to the duration of the disease, though not so strongly; for although dilated tubes may occur in a few months, and phthisis last for many years, yet it cannot be denied, that these are the exceptions rather than the rule. And it is to be borne in mind, that the cases of acute dilatation are principally met with in children.

As illustrative of the occasional similarity of symptoms between this disease and phthisis, I shall abstract a case by M. Andral, which was considered by M. Lerminier to be one of chronic phthisis. In this patient, a disposition to contract bronchitis had existed for several years, and during the year 1821, he complained of a slight oppression. In December he had hæmoptysis for the first time, and in the course of two months his expectoration became abundant, puriform and fœtid, these symptoms were succeeded by pain of the left side. During the month of April following, the expectoration lost its nummular character, but became extremely abundant and fœtid; prostration and emaciation continued, and the patient was attacked by shiverings in the evening, followed by burning heat during the night, but it was observed that he never sweated, a circumstance which excited some surprise, as it was considered that he laboured under pulmonary phthisis: diarrhœa succeeded, and the patient sunk in the month of June following. Here, with the exception of the absence of sweating, all the other symptoms, both in their character and mode of succession, were very similar indeed to those of suppurative phthisis. Nor did the study of the physical signs throw more light on the subject; the respiration was feeble on the left and loud on the right side; the voice resounded strongly over the whole left side, and in the mammary region and at the inferior angle of the scapula, there was evident pectoriloquism. Yet on dissection no tubercles were found, but the disease was shewn to be an example of extreme dilatation of the bronchial tubes of the left lung with the same disease, though in a less degree, in the right.

I apprehend that in the present state of diagnosis the true nature of such a case could not be determined by the most experienced observer; the disease wanted the extreme chronicity which we are taught is necessary for the production of great dilatation of the bronchial tubes. There was hæmoptysis in its early periods, purulent expectoration, emaciation, hectic fever, and diarrhœa, and the physical examination shewed feebleness of respiration, with the signs of cavities in one of the lungs. It is true, that the fœtor of the expectoration, the absence of sweating, and the situation of the cavities, were circumstances somewhat differing from those of ordinary phthisis. But there is not one of them which might not occur in phthisis; and when the other signs and symptoms existed, it is plain that from these alone no physician could have determined that the case was one of dilated tubes, and not of phthisical or other ulcerous cavities.

This case shews the difficulty that may attend the question as to the symptoms merely. In the same way were we to base our diagnosis on the duration of the case, we might also fall into error; for as I have before stated, we may have true phthisis advancing for many years, and when occurring in the adult, often without its usual constitutional symptoms. Bronchitis, on the other hand, may, after a period of several years, pass imperceptibly into tuberculous disease of the lung; and although it might be argued, that if the patient was of a tuberculous diathesis, that disease would have shewn itself before a period of several years had elapsed; yet I have now seen so many cases of bronchitis, which continued for years as such, and ultimately terminated in tuberculous ulceration of the lung, that I place but little confidence in such an argument.

Thus, if we suppose a case presenting symptoms of cough, wasting, and puriform expectoration, and in which we detect a cavity or cavities, it appears to me, that in determining the nature of these cavities we shall be but little assisted by the knowledge that the patient has had cough for four, eight, or ten years, for he may have had a bronchitis passing into phthisis, or primary tuberculous disease of the lung; and the cavities which we discover may have been but recently formed, and, for all we know, advancing by ulceration.

But is the question of time of no importance in determining this point? I would answer, that taken alone, or even in combination with a solitary observation of the case, it has but little value. Here we see an instance of the necessity of successive observations, and the difficulty which often attends diagnosis when we see a patient for the first time. But if we had made several successive observations, if we had ascertained that the signs of cavities had existed for years with but little change, and without the usual symptoms of phthisis, *or the signs of tubercular extension,* then indeed the question of time is of great importance, and of course the greater the period of duration the more certain the diagnosis.

PHYSICAL SIGNS OF DILATATION OF THE TUBES.—It is obvious that the signs of this disease must vary, not only according to the extent of the lesion, but also with its nature. Thus, the signs of the simple continuous dilatation of many tubes will differ from that in which local distentions are produced, so large as to represent pulmonary abscesses. In addition to the signs resulting from these forms of dilatation, we have further those from the compression of the pulmonary tissue, so that the sources of the signs are, first, simple enlargement of the bronchial tubes, next, the existence of cavities, and thirdly, the compression and atrophy of the lung.

It would appear, that when the disease is confined to a single bronchial tube it may escape detection; thus, in one of Andral's cases, the patient had suffered for five or six years from bronchitis. During the two last years an organic disease of the stomach supervened, which ultimately proved fatal, but during his stay in hospital no physical sign of dilatation was detected; the chest sounding clear, and the respiration being heard on both sides, mixed with the usual bronchial rales. On dissection, a calcareous concretion was found in the upper portion of the right lung, and the mucous membrane of the bronchi presented numerous red patches, the tubes being filled with mucus. In the middle lobe of the right lung a bronchial tube was found dilated to nearly three times the diameter of that from which it arose. The lesion was confined to this particular tube, and was not pointed out by any physical sign. The same author details another case, in which an obstinate cough, with abundant puriform expectoration, had existed for a length of time. In this patient, a marked mucous rattle existed on the left side, being heard in the subspinous fossa and the mammary region: here the sound on percussion was clear, and there was no morbid resonance of the voice. It was found on dissection that the bronchial tubes of the inferior lobe were inflamed, filled with puriform mucus, and in many places presenting small dilatations. Here, as Andral remarks, the seat and extent of the bronchitis was pointed out by auscultation, but there was no sign which could lead to the suspicion of bronchial dilatation.

I have already stated, that we are not yet sufficiently informed as to the physical signs of the extensive but continuous dilatation of the bronchi. In a case of this kind, however recorded by the author from whom I have just quoted, the physical signs were a resonance of the voice, not amounting to true pectoriloquism. In the same situation he states that a species of bronchial respiration occurred, as if the individual was blowing strongly at the extremity of the cylinder, while every where else the respiratory murmur was heard as usual. On dissection, in the situation corresponding to this phenomenon, namely, the upper lobe of the right lung, all the tubes were found dilated. To those who are familiar with stethoscopic investigations the relation between the signs and organic changes must appear sufficiently obvious. In some cases, as Laennec has described, this puffing or blowing respiration gets that character which he denominates veiled, by which is meant a modification, giving the idea of a thin veil, or septum, interposed between the observer and the seat of the sign, and moving at each act of respiration.

In the third variety, cavities of different sizes are produced, which contain a fluid, and communicate freely, not only with the original trunk, but with minor branches, and consequently, their physical signs are identical with those of ulcerous cavities of the lung. They present cavernous respiration, gurgling, and pectoriloquism; and if any thing was wanting to add to the resemblance between this disease and phthisical cavities, it is, that the seat of both lesions is most commonly in the upper lobes of the lung.

It is obvious that all these physical signs are common to other diseases of the lung, and hence it is only by their existence in a case in which the duration and nature of the symptoms are opposed to the idea of ulcerous caverns, that we can arrive at the probable diagnosis of dilated tubes. But, on the other hand, where the symptoms, both local and constitutional, resemble phthisis, as closely as in the cases described by Andral and Louis, it seems impossible to arrive at a certain diagnosis, at least on a first examination; and the probabilities as to frequency being always in favour of phthisis, we must, unless some more certain sign be discovered, always incline to the opinion, that the case is one of softened tubercle.

But the facility of arriving at a diagnosis in any case turns on other circumstances than the mere observation of signs and symptoms, with which we have become acquainted for the first time. Much depends on the observation of the progress of the case, and the modification of signs, which has occurred in any given space of time: for example, we are called to a patient who presents the signs of a cavity, but from some peculiarity in the symptoms it becomes a question, whether this is a phthisical ulcer or a dilated tube. Now this can be often determined by successive observations of the case, by which, if we discover an extension of the cavity too rapid to be explained upon the hypothesis of dilated tubes, we may at once arrive at the diagnosis of phthisis. I have frequently had recourse to this mode, and always with success; it is obvious that the cavity may remain stationary, or may extend, and that it is only in the latter case that this diagnosis can be made available, but when we can employ it, is almost always pathognomonic, and forms an excellent illustration of the value and certainty of physical signs.

Another source of diagnosis of a similar character may be drawn from the observation by percussion. In a considerable number of cases of phthisical abscess, the signs of the cavity are often preceded by absolute, and in all by comparative dulness. This we can understand, when we recollect that the phthisical abscess is formed by the suppuration of tuberculous masses and of solidified lung. But these conditions do not precede the dilatation of the bronchial tubes, for which solidity of the pulmonary tissue is by no means a necessary antecedent. On the contrary, if dulness should occur, it would be in the advanced stages of the disease, when the intervening pulmonary tissue had become compressed and carnified. Hence we say, in general terms, *that in phthisis we have first dulness, and then cavity, while in dilated tubes we have first cavity, and then dulness.*

But the bronchial tubes may be sufficiently dilated to give pectoriloquism and bronchophonia without any dulness. Of this the following case, taken from the work of Louis*, is a striking example.

A patient, aged 55, who had been subject to dyspnœa from infancy, had laboured under a chronic bronchitis for several years. This affection was always worse in winter, and at that period he emaciated considerably. During the last month he had lost his appetite, and the cough had become more troublesome; the debility had increased, but there had been neither pain of the chest nor hæmoptysis.

On admission he presented the following symptoms: he was pale; the lower extremities slightly œdematous; the belly large, and obscurely fluctuating: pulse but little accelerated: cough moderate: sputa opaque and greenish: tongue of a dirty white in the centre, with thirst, and complete anorexia. During the last fifteen days he laboured under diarrhœa and night sweats.

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* Recherches Anatomico-Pathologiques sur la Phthisie, Obs. 11.

On percussion the chest was every where sonorous, yet the respiration was almost perfectly tracheal. In the upper portion of the right lung, both anteriorly and posteriorly, there existed a large crepitus; and in these situations the resonance of the voice amounted to imperfect pectoriloquism.

Until the period of his death, which took place on the 19th of December, his debility was progressive, the dyspnœa became every day worse, and during the last week his sputa resembled a greenish pus. The physical signs on the right side underwent no change, but after he had been a week in hospital, the left sub-clavicular region presented a mucous rale, mixed with gurgling. Posteriorly the sound of respiration was strong, and the resonance of the voice considerable.

On dissection the upper portion of the right lung seemed to be converted into a great number of kysts, varying in size from that of a pea to that of a large nut. These proved to be nothing but dilated tubes, containing a reddish mucus, mixed with a yellow opaque fluid. They were in apposition, and were formed of a very thin mucous membrane, which was red, firm, and continuous with that of the bronchial tubes, which were otherwise perfectly healthy. The same lesion existed on the upper portion of the left lung, and extended about an inch and a half from the summit; the dilatation here was less decided than in the right lung; no tubercles nor tuberculous matter could be any where discovered.

This patient was considered by M. Louis to labour under an organic disease of the abdomen, and a chronic and circumscribed phthisis. He states, that the perfect sonoreity of the upper portion of the chest made him at first doubtful, but the results of auscultation were greatly in favour of the existence of tuberculous caverns. Thus the tracheal respiration, the muco-crepitating rale, and the imperfect pectoriloquism, and above all, the situation of these signs, seemed to point out an anfractuous tuberculous cavity. He candidly admits his error, and remarks, that if the affection was tuberculous, and that it had lasted so long as ten years, it should by that time at least have produced an induration of the lung sufficient to give a dull sound on percussion. He further remarks in a note, that he is not ignorant of the fact, that a tuberculous cavity, with indurated parietes, may exist with clearness of sound on percussion, but that in such cases the cavity must be of great size. That the last observation is true I feel fully satisfied; I have never seen a tuberculous cavity which gave a clear sound on percussion, unless where the cavity was very large and well defined, and even here the sound on percussion, though clear, is not similar to that of the pulmonary cells, but has a somewhat tympanitic character. On the other hand, anfractuous phthisical cavities, such as would produce the phenomena detailed in this case, are, as far as my experience goes, always accompanied by dulness of sound on percussion; so that if this rule be general, it would follow, that the occurrence of the signs of anfractuosities with clearness of sound on percussion, will be diagnostic of dilated tubes: of course such a diagnosis should be corrected by the history of the case and the actually existing symptoms. I may observe further, that in this case a combination of certain signs occurred, which I have never found in any case of phthisis, nor can I conceive its existence possible in that disease. I allude to the combination of *extensive tracheal respiration with clearness of sound on percussion.* In phthisis the existence of the first of these signs is accompanied by decided dulness in almost every case. To this I shall return when describing the signs of pulmonary tubercle.

As the treatment of this affection does not in any shape differ from that of chronic mucous catarrh, I shall not further allude to it here, but at once proceed to sum up the state of our knowledge of its diagnosis. It may be stated:

1st. That the cases of this disease which have been described by authors, may be divided into three classes.

(*a*) Cases in which symptoms of chronic catarrh, with copious expectoration, have existed for a number of years, varying from ten to fifty, or even more, and without the constitutional symptoms of phthisis.

(*b*) Cases presenting the symptoms of phthisis, in which the constitution suffers severely; the disease may last from five months to five or even ten years. This last case has been principally observed in adults.

(*c*) Cases which may be termed acute. These are to be observed in children after hooping cough, and the disease has occurred in the space of three months.

2nd. That we meet with this affection as an uncomplicated disease, or in conjunction with other lesions, of which obliteration of the bronchi and tubercle are the most common.

3rd. That dilatation of the bronchial tubes may be accompanied by an atrophy of the air-cells, and thus the affected side of the chest be diminished in volume.

4th. That in the same case we may observe a predominance of dilatation in the bronchial tubes of one lung, and of the air cells in the other.

5th. That the continuous dilatation may affect a single tube without presenting any marked physical signs.

6th. That we may even have numerous small dilatations without other phenomena than those of ordinary bronchitis.

7th. That when the continuous dilatation is decided and extensive, the phenomena which have been observed are the blowing respiration and extended resonance of the voice. In some cases too the veiled puff has been observed by Laennec.

8th. That when the local dilatations are decided, the phenomena are those of suppurating cavities communicating with the tubes.

9th. That although it is extremely difficult, on account of the similarity of the physical signs, and in some cases of symptoms, to distinguish this disease from phthisis with suppurating cavities, yet by observing the mode of combination and the succession of the signs, the rate of increase of the cavities, and the connexion of these with the history of the case, we may, in some cases at least, arrive at a diagnosis which shall be correct.

10th. That where a number of tubes are dilated in one lobe, the case may be distinguished from tuberculous anfractuosities by the clearness of sound on percussion.

11th. That in cases where we have had an opportunity of examining the patient from an early period, the fact of dulness not having preceded the signs of a cavity may enable us to distinguish the disease from phthisis.

12th. That in the same manner the combination of extensive tracheal respiration with clearness of sound,* seems to be diagnostic of dilated tubes.

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* From the very improper mode of examining the post mortem appearances in the lungs, which is commonly adopted in this country, a difference of opinion as to the actual nature of the cavities may occur; and I have seen instances in which, after this irregular dissection, it was not easy to determine the question. I have been in the habit of directing the attention of my pupils to the following points, which enable us to set the matter at rest. The lung should be dissected by means of a fine pair of scissors, in which the end of one blade is blunt, and turned upwards. This instrument may be called a *bronchotome*. The operator, beginning at the bifurcation of the trachea, should follow the tubes to the surface of the lung, and lay as many of them open as possible. For the finer tubes he may use a slender grooved director and a Daviel's scissors. Now if the case be one of simple dilated tubes, he will observe, that all the cavities are in the direction of the tubes, that no transverse division of these can be observed at their junction with the cavity, and that the mucous lining of the tube is perfectly continuous with that of the cavity, which may also present the cartilages, and the longitudinal and circular fibres in a state of hypertrophy. These cavities also differ remarkably from phthisical excavations in never presenting the transverse bands; and should tubercles be absent in other portions of the lung, the point will be set completely at rest.

ULCERATION OF THE BRONCHIAL TUBES.

I shall not occupy many pages on this subject, which is one of more interest to the pathological anatomist than to the student of diagnosis. As yet, indeed, we are ignorant of any symptom or sign which may be considered pathognomonic of the lesion in its simple form, where the ulcerative process has commenced in, and is confined to, the mucous surface of the tube. And even in these more complicated cases of ulceration and perforation of the lung, we recognize the occurrence of bronchial ulceration, less by any signs proper to it as by phenomena resulting from other mechanical conditions, which have resulted from the primary disease. Thus in phthisical abscesses, and in pneumothorax by perforation, the signs of gurgling and metallic tinkling point out a communication with the bronchial system; but while the process which produced that communication was going on, there were no characteristic or proper symptoms or signs.

When we compare the respiratory with the gastro-intestinal mucous membrane, with respect to the frequency of ulcerations, we are struck with the great preponderance in favour of the latter. This is particularly observed in the acute diseases, in which we find that the intestinal surface so often runs into extensive ulceration, a character very different from that of the lung, in which acute bronchitis commonly destroys life without a perceptible ulceration of the surface. Indeed the great majority of bronchial ulcerations are the result of a chronic disease.

The greater liability of the digestive mucous membrane to ulcerate may be understood, when we reflect on the much more extensive development of the mucous glands in that system, the greater necessity for their activity in the normal state, their being open to the action of a great variety of heterogeneous matters, and the varied sympathetic actions which the numerous abdominal viscera exercise upon them.

Andral states, that these ulcerations are more frequent in the larynx than in the bronchial tubes, and more common in the latter than in the trachea. This statement seems certainly true with respect to primary ulceration; but if we take in the cases of tuberculous phthisis, we shall find a great preponderance in favour of the bronchial tubes over even the larynx. The same author has divided the cases of bronchial ulceration into two classes, according to the point as to whether the tube has been destroyed from within outwards, or the reverse. I shall not enter further into this discussion, and shall conclude this short notice by enumerating some of the principal instances of bronchial fistulæ.

(*a*) Suppurated tubercle, and other ulcerous cavities of the lung.

(*b*) Empyema opening into the lung.

(*c*) Evacuation of an hepatic abscess through the bronchial tubes.

(*d*) Communication between an aneurism of the aorta and the lung.

(*e*) Communication between the œsophagus and trachea.

(*f*) Fistulæ of the tubes opening into the bronchial glands.[*]

(*g*) Communication between the thyroid gland and trachea.

(*h*) Perforation of the pulmonary artery.[†]

Other cases have been met with, but in the above list we have the most frequent and best attested examples of the lesion. It may be observed finally, that the communications thus formed, in most instances at least, result from ulceration, commencing either within the bronchus, and perforating outwards, or external to the tube, and taking the reverse direction.

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[*] Les Maladies tuberculeuses des Glandes Bronchiques, par J. M. Berton.

[†] Berton, op. cit.

DILATATION OF THE AIR CELLS.—EMPHYSEMA OF THE LUNG OF LAENNEC.

It seems to me that in adopting the name of dilatation of the air cells for this disease, we avoid much error and confusion. The term emphysema of the lung, given to it by Laennec, is improper, inasmuch as emphysema is not the principal characteristic of the disease, and though a frequent, yet still by no means a constant complication. Indeed it seems certain, that even if we admit the existence of the pleural vesicles of Laennec to have been produced by rupture of the cells, yet that this may exist without true general emphysema of the lung. And it is difficult to conceive how emphysema could exist in the lung without becoming diffused over the body.

That these vesicles under the pleura are often formed by the distention or by the coalescence of many distinct air cells, rather than by the effusion of air into the subserous cellular membrane, is, I am sure, true in a considerable number of cases. For although we may, in some cases, succeed by pressure in changing the position of the vesicle, yet we shall often fail, shewing that the air is confined, and in no respect under the same conditions as in the true emphysema of cellular membrane.

We may consider this affection under three heads.

First. Simple dilatation of the cells without rupture.

Second. Dilatation of the cells, with rupture of their parietes; so that several shall coalesce, and form a cavity of some extent.

Third. The combination of the second condition with a true emphysema of the inter-lobular cellular texture, but which is generally very slight. To this subject I may hereafter return.

This disease consists essentially in a dilatation of the air cells. The lung becomes enlarged, and the whole quantity of air within the thorax is increased. Like the preceding affection it is most commonly the result of a chronic irritation of the mucous membrane of the lung; but it differs from it in these particulars, that while in the former disease the irritation engaged the larger tubes, and was generally accompanied by copious secretion, in the latter we find that the most minute tubes, and even the air cells are the cavities affected, and the secretions more often scanty, viscid, and unelaborated.

Various explanations have been given of the formation of this disease. It has been conceived that the long continued and violent coughing acts in distending the air cells beyond their ordinary dimensions, and from this frequently repeated and long continued dilatation they at last become permanently enlarged. In addition to this, it is held, that the viscid secretion that exists in the minute bronchial tubes acts in blocking these up during expiration, the force of which is not so great as that of inspiration, and hence assists in producing dilatation of the air cells by keeping them in a permanently distended state. There can be little doubt that both these causes act, and their combination seems sufficient to explain the lesion. The existence of an additional cause has been suggested by M. Meriadec Laennec, namely, the expansion of the inspired air in consequence of the temperature of the body. Under this supposition the air entering the cell at a lower temperature, of course soon assumes that of the lung, but as its exit is prevented or impeded by the inspissated mucus lining the minute tubes, its rarefaction must act in dilating the air cell. That this cause may have some effect I do not deny, but it seems probable, that the period of its action must be very limited; and when we recollect the number of passages, through the most vascular organ of the body, that the inspired air has to traverse before reaching the cell, it seems hardly possible that any rarefaction, which it may undergo there, would be at all sufficient to dilate its cavity. It appears to me that there is an additional cause not sufficiently dwelt on, and which is connected with the common complication with spasmodic symptoms. Under these circumstances the circular fibres of the bronchi become increased in strength and in irritability, and their irregular action, it is obvious, must interfere with respiration, and tend to preserve a dilated state of the chest.

To the practical physician, however, the great point of consideration is, that this disease of the lung is the result of bronchitis; and that for its prevention, alleviation, or cure, if that were possible, the treatment must be conducted upon this principle. These patients labour a persistent bronchitis, but are liable to repeated exacerbations, which are often erroneously supposed to be spasmodic, and hence constantly maltreated, but which are in all cases the result of, or accompanied by, an increase of the bronchial irritation; the spasmodic symptoms being the necessary result.

The facility with which we can recognize this disease depends generally on its degree of development. In its slighter forms it may often escape detection, but when it becomes advanced or extensive its diagnosis is easy. But there is another condition of great importance to be considered, namely, *the amount of yielding of the thoracic walls;* and I think I shall be able to prove, that in some important respects the stethoscopic, and even other signs, depend greatly on this circumstance.

Patients labouring under this disease are affected with an habitual dyspnœa, which, in the earlier periods, is often mitigated in summer, to return with violence during the winter; they are also liable to repeated attacks of what might be termed a congestive bronchitis, during which the difficulty of breathing becomes extreme.

The physiognomy of these individuals is almost characteristic. The complexion is generally of a dusky hue, and the countenance, though with an anxious and melancholy expression, has in several cases a degree of fulness which contrasts remarkably with the condition of the rest of the body. It is probable that this results from hypertrophy of the cellular membrane and respiratory muscles of the face; the first produced by repetitions of venous obstruction, and the second by the violent exertion of the whole system of inspiratory muscles. The nostrils are dilated, thickened, and vascular. The lower lip is enlarged, and its mucous membrane everted and livid, giving a peculiar expression of anxiety, melancholy, and disease to the countenance. The shoulders are elevated and brought forward, and the patient stoops habitually, a habit contracted in his various fits of orthopnœa and cough, and the relief which is experienced from inclining the body forwards. Thus, even in bed, we often find these patients sitting up, with their arms folded and resting on their knees, and the head bent forwards, the object of which seems to be to relax the abdominal muscles, and to substitute the mechanical support of the arms for that of muscles which would interfere with inspiration. To such a degree does this habit of stooping alter the conformation of the chest, that I have seen several cases in which the acromial, inter-scapular, supra and sub-spinous surfaces had become nearly horizontal. Under these circumstances the apices of the scapulæ are remarkably projected; anteriorly we observe the clavicles arched and prominent, and the triangular spaces which answer to the insertion of the sterno-mastoid, and scaleni muscles are singularly deep. The cellular membrane and adipose tissue of the neck seem to be absorbed, but the muscles of inspiration, and particularly the sterno-mastoid and scaleni are hypertrophied, and the thyroid cartilage is generally prominent and hard, so as to feel as if ossified. When we examine the chest we discover other and remarkable changes; the sternum has lost its flatness, or its relative concavity, but is thrown forward and arched both in a longitudinal and transverse direction; the intercostal spaces are widened, but not dilated as in empyema: on the supero-anterior portion, indeed, the chest seems smooth and convex, but this is owing to the hypertrophied state of the pectoral muscles, a condition induced by the long-continued difficulty of respiration. When we examine the side, however, we see the intercostal spaces deeply marked, and presenting no indication of protrusion; so that if we compare the diseases of dilatation of the cells and empyema, with respect to the external conformation of the chest, we find that in the first, the appearance of smoothness and dilatation is most evident superiorly, while in the latter the reverse occurs. The lateral portions of the chest are remarkably deep, and their convexity not at all proportioned to that of the anterior or posterior portions of the thorax. On applying the hand to the inferior sternal region we generally find that the heart is pulsating with a violence which we would not expect from the examination of the pulse at the wrist, which is often small and feeble, while the impulses of the right ventricle are given with great strength. These phenomena are generally owing to an hypertrophied state of the right cavities of the heart, which so commonly attends this disease, an affection, frequently attended with a violent impulse and feeble pulse. But I have observed two other causes for the production of this symptom or sign, the knowledge of which is of importance, inasmuch as that they may produce the phenomenon in question without disease of the heart actually existing. The first of these is the displacement of the heart by the dilated lung, which pushes it downwards, so that its impulses become manifest in the epigastric region, not from disease, but from displacement. This should be observed more remarkably when the pulmonary disease predominates in the left side; in the cases which I have seen, the disease affected both lungs equally. The other cause for this symptom is a congested and enlarged state of the liver, which not unfrequently accompanies the disease, from causes sufficiently obvious.

On examining the epigastrium, and indeed the whole of the supero-anterior portion of the abdominal cavity, we commonly find it full and resisting, although without any perceptible or distinctly localized tumour. On percussion the right hypochondrium and the epigastrium sound dull, and in certain cases we are able to trace the margin of the liver below the false ribs. This may depend on two causes, either an enlargement of the organ, or its displacement by the flattening of the diaphragm. To the latter condition of this muscle I shall presently direct the attention of the reader.

PHYSICAL SIGNS OF DILATATION OF THE CELLS.—The physical signs of this disease are few, but in most cases, where the disease is established, are so well marked, and so obvious, that there is hardly a disease to which physical diagnosis is more easily applicable. The following are the sources of the physical signs in this affection:

1st. The increased quantity of air within the thorax.

2d. The increased volume of the lung,* and the resistance of the thoracic parietes.

3d. The displacement of the heart and abdominal viscera.

4th. Bronchitis of the minute tubes.

5th. Congestion of the lung.

6th. The existence of the sub-pleural vesicles of Laennec.

On percussing the chest, in a case where the disease is decided, we observe that the sound is morbidly clear. It is not, however, tympanitic, as in pneumo-thorax, but may be described as the maximum of the true pulmonary sound. In a case of extensive disease this clearness is general, but it may be partial, and merely correspond to the most affected portion of the lung. It is but little, if at all, increased on a deep inspiration, in which it differs remarkably from the sound of the healthy lung, but agrees with that of its solidified state. In fact, this character, though occurring in states of the lung so opposite as its rarefaction and solidification, is yet owing to the same cause in both, namely, the greatly diminished volume of air which can enter at an inspiration.

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* Although this and the preceding condition may be said to imply the same state of things, yet it is necessary to separate them, as the first is the source of the passive, and the second an important modifier of the active auscultatory phenomena.

We may further observe, that the sound on percussion is often clear down to the lowest portion of the thorax. The natural hepatic dulness of the postero-inferior portion of the right side disappears, and unless where the heart is much enlarged, the sound of the cardiac region is remarkably clear. This will be particularly the case if the lung overlaps the pericardium to any extent, of which we can easily satisfy ourselves by means of the stethoscope.

But in almost all cases of such extensive disease, we find a complication with enlargement of the heart, the result of the long-continued and increasing obstruction to the pulmonary circulation, and this will give an increase of dulness over the organ, particularly at its right side. We then find that there is dulness from the situation of the apex of the left ventricle as far as the right side of the sternum; and as Piorry has remarked, the extent of this dulness may be found to vary according to the degree of pulmonary obstruction. This is the most common case; but in a few instances, even though the enlargement of the heart be considerable, we find in these regions a clear sound on percussion, or, at all events, a want of dulness commensurate with the heart disease, a circumstance explicable by the increased volume of the lung, which, by throwing the parietes forwards, buries the heart in the thoracic cavity. In such cases the impulse of the organ ceases to be a measure of its disease, and we are surprized at finding an hypertrophied heart, although, during life, the impulse at the side and lower sternal regions had been slight. As a general rule we may state, that where this complication exists with a distinct impulse, the sound, on percussion of the cardiac region, will be dull.

But the morbid clearness of the chest is not met with in all stages of the disease; it is only observed when the affection has arrived to an advanced degree, and may be altogether wanting in the earlier periods. A patient may have a degree of dilatation of the air cells sufficient to give decided feebleness of respiration, without any perceptible increase in the clearness of sound. Of this I saw a remarkable instance in a patient who was admitted into my wards, and who presented a group of symptoms and signs which led me to suspect the existence of an aneurism of the aorta; his complaints had been of about five months' standing, up to which time he had enjoyed good health; he then contracted cough, followed by severe dyspnœa on exercise, and some pain in the back and upper portion of the chest. We found that both sides sounded equally upon percussion, nor was the sound at all morbidly clear. The respiration in the right lung was puerile, while in the upper portion of the left it was exceedingly feeble. The impulse and sound of the heart, as observed below the mamma, seemed natural, but a double pulsation could be heard at the upper portion of the left side: there was no bruit de soufflet, dysphagia, or laryngeal breathing.

Here was a group of symptoms and signs, which I thought might possibly depend upon a small aneurismal tumour, compressing the left bronchus. But I made no positive diagnosis in the case. The patient sometime afterwards died with effusion into the chest; and on dissection it was found that there was no aneurism, but that partial dilatation of the air cells existed, affecting only the upper portion of the left lung, and that the right cavities of the heart were dilated and somewhat hypertrophied. The feebleness of respiration was clearly attributable to the dilatation of the air cells; and the case shews, that this lesion may exist to such a degree as to give distinct stethoscopic signs, although the sound on percussion be not perceptibly increased. In other cases too I have found on dissection, dilatation of the air cells to some extent, although during life percussion gave no unusual results.

I now proceed to consider the remaining sources of physical signs in this disease, or those which are the principal causes of the active auscultatory phenomena. I shall, in the first place, dwell on the increased volume of the lung, and consider it first in relation to the stethoscopic signs, and next, as causing displacement of adjacent parts. And we shall inquire how far the degree of resistance afforded by the thoracic parietes tends to influence both the auscultatory signs, and those more obvious ones, which proceed from the displacement of surrounding organs.

The modifications of the sounds of respiration in this disease depend on the following causes:

1st. The increased volume of the lung.

2d. The existence of bronchitis, principally affecting the minute tubes, and often complicated with congestion of the lung.

3d. The formation of the sub-pleural vesicles.*

The first of these sources of modification of the respiratory phenomena being the most important in the diagnosis, I shall dwell particularly upon it.

One of the first circumstances which strikes the observer in this affection, is the want of accordance between the inspiratory efforts, and the sound of pulmonary expansion; the first being evidently excessive, and the latter extremely feeble. When he employs percussion he will at once discover that the cause of this feebleness cannot be any solidification of the lung, as the sound is either natural, or clearer than natural, and under these circumstances he must seek for some other cause to explain the phenomenon. It appears to me, that in the increased volume of the lung, he will find the cause of this important sign: for the organ being in a permanent state of enlargement, *the dilatation of the chest can be but little added*

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* This source of signs is given on the authority of Laennec, and it is to be recollected, that these vesicles are not necessarily attendant on the disease.

to by the inspiratory effort, and hence the sound of respiration becomes proportionably feeble. Hence this feebleness of respiration, coinciding with clearness of the chest and increase of the inspiratory efforts, becomes the most important physical sign of the disease in question. Other causes, however, have been enumerated, particularly the thickening of the mucous membrane, the result of that chronic bronchitis which so constantly attends this affection. Thus Laennec has stated, that in the dry catarrh, which so commonly produces this disease, the mucous membrane of the minuter tubes is often extremely thickened, which, to a certain degree, explains the feebleness of respiration, and also the fact, that when we compress the lungs taken from an emphysematous patient, we find greater difficulty in reducing them to their state of flaccidity than if they were in their ordinary condition. In fact, *cæteris paribus,* the sound of respiration is directly as the facility of the entrance of the air, and any mechanical obstruction, whether in the trachea, the larger or the more minute bronchial tubes, will cause a corresponding feebleness of the respiratory murmur. This has been long known; I remember seeing an interesting example of this in a patient whose chest I was requested to examine previous to the performance of tracheotomy. The history of the case was such as might warrant the supposition of the existence of a pulmonary emphysema. On percussion the chest sounded everywhere extremely clear, but the vesicular murmur was feeble, notwithstanding the violent efforts of the patient; yet on the trachea being opened, it became at once loud, even to puerility, and continued with this character for some time after the operation.* But without denying that this thickening has an effect, I cannot help thinking, that we must also attribute much to the increased volume of the lung for the following reasons:

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* See Beau, Archives Generales, 1835.

First. In cases of ordinary bronchitis, even when the minute tubes are engaged, this remarkable disproportion between the inspiratory efforts and sound of expansion is either not observed, or occurs in a much smaller degree. In these cases we hear either a mixture of the vesicular murmur with various rales, or observe that the murmur is almost masked by the rales; but in both cases the phenomena indicate full expansion and contraction of the lung, and their intensity can be remarkably modified by the efforts of the patient. Yet in cases of dilatation of the cells this is not observed, and the phenomena are but little modified whether the patient breathes in his ordinary manner, or makes an increased effort at inspiration. In the former case the air cells may be considered as unaffected, and on the obstruction which results from the thickening of the bronchial membrane, or the presence of secretion in the tubes being overcome, the lung expands, and this expansion is evident to the auscultator.

Secondly. I have observed that in confirmed dilatation of the air cells, the sign of feebleness of respiration is but little affected by the increase or diminution of the bronchitis, at least as far as we can judge of the latter by the physical signs and constitutional symptoms. Thus, it not unfrequently happens, that such patients are attacked with exacerbations of the bronchial irritation, which may subside under treatment, but during their continuance the physical signs are less an increase of the feebleness of respiration than of the various rales; and on the other hand, when they subside, that feebleness is scarcely, if at all, diminished: in fact, the sign of feebleness is but little affected by the increase or diminution of the bronchitis, a circumstance quite in accordance with my view of its cause, namely, the diminished quantity of air that enters the affected portion of the lung.

I have already stated, that the feebleness of respiration in this affection is owing to the increased volume of the lung, by which the amount of the inspiration is diminished; for if the lung be thus hypertrophied, so as to press strongly on the chest, and preserve that cavity distended, even after expiration, it is obvious, that on the next inspiration the volume of air entering will be minus the expanding of the lung from its own distending force.

Let us suppose that the area of the healthy chest, after expiration, to be equal to 10, and the maximum of its expansion to be equal to 15, it is plain, that if from the disease the lung acquires a volume in rest equal to 12½, the inspiration would be diminished by one-half; hence a cause of feebleness of respiration, as part of the inspiratory effort, is supplied by the expansion of the lung, which results from its being kept compressed in the state of rest.

It is obvious, however, that the physical signs of the pulmonary compression must vary according to the rigidity of the thoracic walls. If we take two cases of Laennec's emphysema, and suppose that in one the chest yields *pari passu* with the enlargement of the lung, while in another it is rigid and unyielding, it is plain that the physical condition of the lung, and of course the physical signs of its actions, must be different. If the feebleness of respiration depend upon the compression of the lung, it should follow, that if in any case the chest yielded easily and fully to the pulmonary enlargement, we might have great and extensive dilatation of the cells, without the sign which is supposed to be characteristic, so that the feebleness of respiration would seem more a measure of compression of the lung than a direct sign of dilatation of the cells. Of these views the following case is strongly illustrative, and I place the more value on it as the patient has been at different periods under my observation.

A young man, of feeble muscular development, and considerably below the middle size, entered the Meath Hospital, labouring under the usual symptoms of Laennec's emphysema; the chest was enormously enlarged on both sides, but the principal yielding seemed to have taken place in the upper and anterior portions; the circumference at the mammary regions being three feet and an inch, an increase of at least seven inches above its natural development. The sternum and clavicles were arched, the scapular regions nearly horizontal, and the development of both sides equal. Yet, in this case, the characteristic signs existed only in the supero-anterior portion of the right side, while over the rest of the thorax the respiration could be heard loudly, and after the individual had been treated for bronchitis it was pure. In this case the symptoms had lasted for upwards of five years, and after the second year the enlargement of the chest became so manifest as to excite the attention of all the patient's friends.

Here there was a case in which the yielding of the chest was more remarkable than any we had ever witnessed, and yet over the greater portion of the thorax the respiration was any thing but feeble; and it is a most curious and interesting fact, that with the absence of the signs, there was also absence of the symptoms of compression. There was no evidence of disease of the heart; there had never been œdema; the jugular veins were not distended; the liver was not depressed; and the patient, so far from being embarrassed by exercise, was always better after walking a considerable number of miles. A short time before entering the hospital he performed a journey of forty miles on foot in the course of a single day. His only inconvenience was the recurrence of bronchitic attacks, but when these were absent his general health was excellent.

It might here be inquired, what was then the cause of the feebleness of respiration in the anterior portion of the right lung. I think that in all probability there was here rupture of the air cells, and that in this condition we have a cause, in addition to that of compression of the lung, for the ordinary feebleness of respiration.

We shall now consider some of the other physical signs, which result from the enlargement of the lung, and which, like the preceding, vary with the amount of resistance of the thoracic walls.

SIGNS CONNECTED WITH THE INTERCOSTAL MUSCLES AND DIAPHRAGM.—The next result of the increased volume of the lung, which we now consider, is its effect in displacing the more yielding parts of the thorax. These may be considered to be the mediastinum, the intercostal muscles, and the diaphragm; and we shall find, that although the mediastinum yields in cases of the disease occurring in a single lung, yet that the muscular expansions exhibit a great power of resistance, and in many cases do not yield, even after the chest has been much enlarged. In this respect we observe a remarkable difference between this disease and empyema, in which the yielding of the muscular expansions forms one of the most important signs.

When we examine the intercostal spaces in this affection, even after great dilatation of the chest has occurred, we see them, so far from being obliterated, deeply marked, and the muscular fibres acting powerfully, so as to elevate the ribs, and assist in the imperfect inspiration. I have never seen an exception to this, and the rule applies to every intercostal space; and as a point of difference between the two diseases of accumulation, empyema, and Laennec's emphysema, it is of the greatest interest. When I come to consider empyema I shall point out the causes of this difference, which have not been hitherto understood.

But the same remarks cannot be made with respect to the diaphragm, which, in certain cases, yields before the enlarged lung, so as greatly to increase the cavity of the chest downwards. This circumstance may be taken as a most important distinguishing mark in cases of this disease, which may be divided into those with, and those without, diaphragmatic displacement.

From the position of the muscle, and its inferior mechanical support, we should expect, *a priori*, that it should yield more to mechanical pressure than the intercostals. And such I have ascertained to be the fact, as while I have often seen displacement of the diaphragm, in no case did I find that the intercostals were similarly affected.

Between the two cases of Laennec's emphysema, with and without this displacement, I have observed some striking differences as to symptoms and signs. Of those in which the diaphragm is not affected, we have an excellent example in the case which I have described of great yielding of the thoracic walls. Here the signs of pressure on the lung were much less distinct, and there existed no indication of hepatic displacement, the epigastrium, so far from being tumid, being actually collapsed. But in the case with displacement of the diaphragm we observe that there is much more distress in breathing; that the epigastrium is full and resisting, and that the heart is pushed down sometimes so far as to be on a level with the ninth, or even tenth intercostal space.

Under these circumstances the postero-inferior portion of the chest, and the regions of the liver and heart anteriorly, give a perfectly clear sound, which is explicable by the displacement of these viscera, and also by the condition of the lung.

When these patients are stripped, and lying on the back, a remarkable character of respiration may be observed. We see the thorax powerfully elevated upwards, and the abdomen as powerfully protruded downwards; but there is this remarkable difference from forced respiration in the healthy state, that the abdominal protrusion does not begin so high, and while the umbilical and hypogastric regions move upwards and forwards, the epigastrium and upper portions of both hypochondria remain comparatively motionless, while the corresponding ribs are drawn in. This is explicable by the new position of the diaphragm; it has descended, and carried the abdominal viscera before it; and its contraction takes effect at a point lower in proportion to its displacement.

That this displacement is a purely mechanical result, and not analogous to that in empyema, shall be shewn hereafter.

It varies so remarkably with the volume of the lung, that I have seen the heart, after the subsidence of a bronchitic attack, mount from the tenth to the eighth intercostal space.

On the subject in general, we want some accurate dissections. I regret that my experience is but limited, but I shall state it. It would appear that much will depend on whether the disease predominates in the upper or lower lobes; if in the latter, the shape of the lung is altered, and I have found in this way, that from the great enlargement of the cells, and the formation of sub-pleural vesicles, the lower surface, from being concave, had become flattened, or even convex. Under these circumstances the diaphragm must of course yield.

In a patient who died in the Meath Hospital, the following appearances were found: the liver was in its natural situation, but the left ala of the diaphragm was pushed far down, so as to become convex towards the abdomen.* But a source of fallacy exists in this case, and in all dissections made to clear up this point, it must be borne in mind that the diaphragm may have yielded *post mortem*, merely from the pressure which, during life, it had been able to resist.

SIGNS FROM THE DISPLACEMENT OF THE MEDIASTINUM.—In considering these signs we find, that although they may exist so as to be demonstrable during life, yet that they are less remarkable than those in empyema. In certain cases where the disease is confined to one lung, the morbid signs extend across the mesian line to a distance proportioned to the extent of the disease; and as in empyema we have dulness and absence of respiration extending across the mesian line *from disease of one pleura*, so in the dilatation of the air cells we have the morbid clearness and characteristic respiration, under the same circumstances; and if any thing was wanting to complete the analogy, it is, that the displacement of the mediastinum can be observed to vary with the state of disease in either case.

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* For this dissection I have the authority of my friend, Dr. Hudson, who then acted as clinical clerk in the medical department of the institution.

Thus, when the dilatation of the cells is confined altogether, or nearly so, to one lung, percussion gives a peculiarly clear sound over the affected side; and if the disease has displaced the mediastinum this clearness will be found across the whole sternum, and it may be for an inch or so beyond it. This line, which is well defined, having been passed, we then observe the natural pulmonary sound, which an experienced ear will have no difficulty in distinguishing from that of the diseased lung. If the observer now applies the stethoscope over the affected side, and carries the instrument across the chest, he will find that the peculiar phenomena of respiration do not disappear until he passes the sterno-costal articulations of the opposite side, where, like the clearness on percussion, they suddenly cease, and are replaced by the natural respiratory murmur.

I must state here, that although we should expect *a priori* that these signs always exist in the advanced stages of the disease, when confined to one lung, yet that I have only verified them in a single instance, and that additional observations will be necessary to ascertain their exact value or constancy. I have little doubt, however, from the analogy of the disease in question with empyema, that they will be found to occur in all cases of confirmed dilatation of the cells, when the disease occupies but a single lung.

But although in both instances the mediastinum be displaced, yet in the disease before us the change is seldom seen in so striking a manner as in empyema. One reason for this may be the fact, that in most cases of decided dilatation of the cells, the disease exists in both lungs, while double empyema is one of the rarest of diseases. Another will be admitted when we recollect that the inflammatory action of pleuritis, by softening the serous membranes, will render them more likely to yield in that disease than in Laennec's emphysema, where no such action exists.

The heart, of course, will follow the displaced mediastinum, and its position vary with the affected lung and the amount of disease. My experience, however, leads to the conclusion, that in this affection lateral displacement of the heart is rarely seen to any remarkable degree, another circumstance of difference between this affection and empyema, and to be explained by the preceding considerations. This remark, however, does not apply so much to the displacement downwards, which, as I have shewn, may occur to a very great degree. Under these circumstances the præcordial region is clear on percussion, and the impulse of the heart may be altogether wanting in its natural position, but occur as low down as the tenth rib, and between the costal cartilages and mesian line.

It is now admitted that most of the patients affected with this disease die with symptoms of morbus cordis and general dropsy, and it is not difficult to understand why disease of the heart should be so common a complication. The cause of this seems to reside almost altogether in the great enlargement of the lung, which must have a deleterious effect upon the heart in the following respects.

First, as I have already shewn, by its interference with the process of inspiration. The experiments of modern physiologists have shewn the great influence which is exercised by the respiratory process on the venous circulation; but in the disease before us we find the chest in a state of permanent dilatation, to which the inspiratory effort can add but little, the manifest consequences of which must be an accumulation of blood at the right side of the heart, and consequent disease of its pulmonary cavities. The vena cava becomes loaded, the hepatic veins engorged, and the liver consecutively engaged. Under these circumstances the muscular parietes of the heart become hypertrophied, and an active aneurism of the auricle and ventricle is produced.

Secondly, it seems more than probable that the same pressure which has distended the chest and displaced the diaphragm, must act directly in impeding the circulation through the pulmonary artery and its ramifications, and thus we see an additional cause for the production of hypertrophy of the right cavities of the heart.

Lastly, we must recollect that the heart itself is under the influence of anormal pressure. It is removed from its natural situation, and to a certain degree deprived of its natural protection by the bony and elastic parietes of the chest, and is compressed between the distended lung, on the one hand, and the distended abdomen on the other. Under these circumstances its actions of dilatation and contraction must be materially interfered with, the auricles will experience a powerful impediment in filling the ventricles; and if these cavities have an active power of dilatation, this must also be materially impeded. Thus, many circumstances concur to derange the pulmonary, cardiac, venous, and hepatic circulation. And we can only wonder at the powers of nature in prolonging life under such a complication of evils. In the great majority of cases such patients die with symptoms of what is commonly called hydrothorax, to the disappointment of the practitioner, who prescribes according to the rules of the nosological writers, and a *post mortem* examination will reveal the causes of his failure, and the error of his teachers.

SIGNS FROM THE EXISTENCE OF BRONCHITIS.—On the subject of the signs manifestly proceeding from bronchial irritation I have to remark, that there is not one of them which can be considered as pathognomonic of the complication with dilated or ruptured air cells, inasmuch as we may find them all in cases where no such affection exists. None of them are constant; and when they do occur, scarcely differ from what is observed in simple bronchitis: we may have all varieties of the sonorous, sibilous, mucous, and muco-crepitating rales in this affection, and the occurrence and mode of combination of the phenomena are infinitely various. The two most common are, the dry sibilous, and a diffuse mucous rale. Laennec has stated that there is one form of rale which is pathognomonic of the interlobular emphysema, although it may also occur in the simple dilatation; this he calls the *dry crepitating rale with large bubbles,* and describes it as conveying the impression of air entering and distending lungs which had been dried, and of which the cells had been unequally dilated. He compares it to the sound produced by blowing into a dry bladder; and states farther, that it is similar to that observed in common sub-cutaneous emphysema when we press the stethoscope on the affected portion. Now, without at all calling in question the extraordinary tact of Laennec, I would say, that this is a sign, which, if it does exist, must be so easily confounded with other phenomena, such as those proceeding from bronchitis, that an ordinary observer would not be safe in founding a diagnosis on its supposed existence. I have never been able to satisfy myself that I had recognized it, and have even found the interlobular emphysema in the lungs of persons, in whom during life I was not able to distinguish the rales from those of simple catarrh. He states, however, that the phenomenon is not common, and when it exists is of short duration, and observed in points of only small extent. On this subject further observations are necessary.

I shall lastly allude to the sign of the rubbing sound, or *frottement,* which has been described by Laennec as an indication of those sub-pleural air vesicles which occur in the interlobular emphysema, and which, according to him, when occurring with the other symptoms of dilated cells, may be looked on as diagnostic of the lesion in question. But this point of diagnosis, like the last, requires still further investigation; and indeed it seems difficult to understand how the existence of an air vesicle could give rise to the rubbing sound. We know that in the healthy condition of the internal surfaces of serous membranes, the friction of their opposite faces is so diminished by their smoothness, and their being lubricated by the serous exhalation, that no perceptible sound accompanies their motions. It is only when the surfaces are rendered dry by an arrest of secretion, or roughened by the effusion of lymph, that their motions produce sounds perceptible to the ear. Now, even where extensive vesicles exist, we commonly find that the serous surface, as far as smoothness and lubrication are concerned, continues in its natural state; and I cannot help agreeing with Meriadec Laennec, that the sign of frottement is to be looked on more as an indication of slight pleurisy than of these sub-pleural vesicles. I have never observed this phenomenon unless in cases where the serous surface was roughened; and as it is admitted, both by the above author and by M. Reynaud,* that the sound in pleurisy is undistinguishable from that described by Laennec in this disease, we have, I think, sufficient reasons for extreme caution in the diagnosis of sub-pleural vesicles from the existence of the sign in question.

It might be supposed that the permanence of the sign and the absence of pain would prove diagnostic marks, but the truth is, that even these circumstances will not be sufficient. Thus I have seen cases in which the frottement of pleuritis continued for a month with scarcely any alteration, and in which, after the first week, the patient felt no pain, and only complained of the rubbing sensation produced during respiration, in the affected part.

Before leaving this subject I shall describe another sign which promises to be of the greatest importance in diagnosis. It is founded on the difficulty of expiration which occurs in this disease, a difficulty by some attributed to the obstruction of the minute bronchial tubes, and more lately by Majendie to the diminished elasticity of the lung itself.

I have at present under my care, a patient aged upwards of sixteen years, who has been subject to cough and dyspnœa from infancy. The right side is enlarged, and very convex anteriorly, the sternum somewhat arched, and the clavicle elevated. Over this side the sound is morbidly clear on percussion, and the clearness extends across the sternum; yet on applying the stethoscope during ordinary respiration, nothing is heard but a muco-crepitating rale, occasionally combined with Laennec's *rale crepitant à grosses bulles;* these signs are audible during inspiration, while expiration is marked by a dry prolonged wheeze. On a forced inspiration, however, a distinct sound of pure pulmonary expansion follows the rales above-mentioned.

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* See Journal Hebdomadaire, No. 65.

From these observations I concluded that the case was one of Laennec's emphysema, which had not yet arrived at its most extreme stage, inasmuch as that by a forced inspiration the lung could be still considerably distended. It then struck me that by making the patient perform a number of forced inspirations rapidly, the lung might be so far distended with air as to prevent the occurrence of any natural sound of pulmonary expansion for a time, and that thus we might obtain a direct proof of the difficulty of expiration. This experiment I put into effect, and found that after four or five inspirations, rapidly performed, the respiratory murmur altogether disappeared, nothing being heard but the crepitating rales, and even these in a diminished degree. The patient was now allowed to rest and to breathe naturally for a certain number of times, when on the experiment being repeated, the first inspiration was distinctly followed by the murmur, which, however, diminished at each successive effort, until at length it became extinct as before.

The results of this experiment are easily explained by referring to the difficulty of expiration, proceeding from either or both of the causes already alluded to. In fact, the repetition of the inspiratory efforts caused such an accumulation of air in the diseased portion of the lung, as ultimately to nearly prevent its further expansion, and thus hinder the sound of the respiratory murmur. But on the cessation of these efforts the air was gradually evacuated, and the lung restored to its original condition. If this sign be found constant, it will be a most valuable addition to our means of detecting the emphysema of Laennec, but the frequent repetition of the experiment must be avoided.

TREATMENT OF DILATATION OF THE CELLS.

The first point to be examined into in discussing this part of the subject, is whether a cure of the confirmed disease be possible; the next, whether we are in possession of means capable of relieving the affection to a certain degree, or of preventing its further extension; and the third, supposing the disease capable of modification or cure, to determine what are the indications and proper modes of treatment, I shall examine these important questions in succession.

Can we expect, after the disease is established, that the dilated air cells can ever resume their natural condition? Now we find that some patients have laboured under this disease, or its causes, from infancy, while in others it is brought on by bronchitis at a late period of their lives, and after many years of previous health. In the first case, it seems scarcely possible that any effort of medical skill can restore the lung to its original condition, and all that we can hope for is to palliate the symptoms. But in cases of a comparatively recent origin, to give up all hope of cure seems scarcely in accordance with our knowledge of analogous affections. We may consider the pathological condition of the air cells in the same point of view that we look upon chronic dilatations of other hollow organs, such as those of the stomach, colon, bladder, and heart. In these cases we commonly observe the two following circumstances to occur: first, that the cause of the dilatation is some mechanical obstruction to the exit of their natural contents; and next, that if this obstruction be long continued, what was first a mere dilatation or distention of the organ becomes a combination of this with an organic alteration of the parietes, which is in most cases an increase in their thickness and strength. Hence the hypertrophy of the muscular fibres of the stomach when the pylorus is obstructed; of the bladder when the urethra or prostate are diseased; of the colon in stricture of the rectum; and of the right cavities of the heart in affections of the lung. This change from mere dilatation to increase of growth seems to be a condition very unfavourable for cure, and the chances of its production may be stated to be directly as the length of time the obstruction is allowed to continue; for we know that in the earlier periods of these mechanical dilatations, the removal of the obstruction is often followed by the return of the cavity to its natural dimensions. Applying these considerations to the case of dilatation of the air cells, it seems not impossible that in the earlier periods the removal of the obstruction would be followed by a subsidence of the disease; for when we inquire into the causes of the affection, we find these to be principally obstructions to the free exit of the contents of the cavities; the viscid mucus and the turgescence of the bronchial tubes being to the air cells what pulmonary obstruction is to the heart, or urethral to the bladder; and the distention in these cases being perfectly analogous.

We may then admit that where actual change of structure has not occurred, a cure, or a great alleviation of the disease is not impossible. Our next inquiry is, whether there is evidence of such ever occurring. On this question Laennec speaks doubtingly. After alluding to the combination of extravasation of air with dilatation of the air cells, he observes, that it is of slight consequence as compared with the latter affection, as we can hope for its removal by absorption as in other similar cases, whilst we cannot well see in what manner either nature or art can remedy the other morbid derangement.

"At the same time," he continues, "I do not think we are justified in considering this affection as altogether incurable. In several instances I have fancied that I discovered the traces of cicatrization of ruptures of the pulmonary tissue of the kind above described. In the case of subjects affected with asthma I have several times, during the fits, detected a crepitous ronchus with large bubbles, which ronchus entirely disappeared afterwards; and it is quite intelligible, that if we can diminish the intensity of the cause which keeps up the habitual distention of the cells, we may in the end hope, that these will be actually lessened in volume."* The same author, when describing the treatment of dry catarrh by alkalies, states, that many persons who had already emphysema of the lungs, and either incessant dyspnœa, or very frequent fits of asthma, have been restored by this treatment to a state of health so comfortable, that they hardly exhibited any signs of disease.

The question as to the curability of Laennec's emphysema has been scarcely agitated in medical circles; and Dr. Osborne deserves great credit for bringing this subject forward in an excellent paper on the pathology and treatment of dropsy, which he read at one of the late meetings of the King and Queen's College of Physicians, in which he states his conviction, that this disease is at all events susceptible of great amelioration, on the ground that in certain cases he observed the feebleness of respiration, and morbid clearness of sound, to subside, or become greatly diminished, after treatment calculated to remove the obstruction, and diminish the frequency and violence of cough. On this subject I can only bring forward the observations of a few cases, but which, as far as they go, are of great importance in elucidating the question. In the patient, to whose case I have already alluded as illustrative of the diagnosis from mediastinal displacement, I found that after certain treatment, calculated to relieve bronchial irritation and diminish cough, that coincident with great relief of symptoms, the following changes in the physical signs took place: first that the morbid clearness of the affected side, though not removed, was diminished, and that it terminated at the mesian line in place of extending, as before, beyond the opposite side of the sternum. Secondly, that the rales became more humid and larger, and the vesicular respiration was manifestly increased. And thirdly, that the stethoscopic phenomena, like those of percussion, ceased to be heard beyond the mesian line of the sternum, when they had been before audible, and that in this situation they were replaced by the healthy murmur of the opposite lung. These alterations in the signs, so characteristic of diminution in the obstruction and volume of the affected lung, were accompanied by the most marked improvement in the symptoms; the cough, dyspnœa, and acceleration of breathing being wonderfully diminished, and the condition of the patient in every respect improved.

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* See Dr. Forbes's Translation.

The treatment pursued was the employment of local bleeding and counter-irritation, with the exhibition of the tartar emetic for several days, followed by sedative and demulcent remedies.

That in this case the volume of the affected lung was reduced by treatment, there can be no doubt; and when we connect the results of the case with those obtained by Dr. Osborne, and with the observations of Laennec on the treatment of dry catarrh, we have decided evidence in favour of the possibility of the diminution of the disease, and are consequently justified in considering it as not altogether incurable. In another instance I have seen the heart, which was so much displaced downwards as to pulsate at the cartilage of the tenth rib, after a few days of treatment, remount towards the thorax, and correspond to the eighth intercostal space.

Some important questions here arise. Is the mere diminution or even removal of the obstruction all that is necessary for the restoration of the lung to its natural condition, or may there not be some other morbid state to be overcome before we can bring about so fortunate a result? Does a paralysis or atony of the circular fibres of the more minute tubes exist? Or, as Magendie has suggested, is the natural elasticity of the lung destroyed or injured? It seems not improbable but that both these circumstances may occur, the muscular structure being paralyzed, as we see in the case of the bladder or the intestinal tube, and the longitudinal fibres losing their elasticity from the persistence of chronic irritation, just as the elastic coat of arteries loses its property when chronic disease affects these vessels.

It is plain that farther observations are necessary to clear up these points; and I shall merely remark, that after the use of treatment calculated to remove congestion, inflammation, or other obstruction of the minuter tubes; after the adoption of the means which Laennec has pointed out for the relief of the dry catarrh; and lastly, after using all means which could moderate the cough, or render it less frequent, we might then have recourse to measures calculated to stimulate the contractile tissues of the lung. As yet we are not in possession of means capable of restoring elasticity to such tissues as the longitudinal fibres of the lung, or the middle coat of the arteries; but we do know of remedies capable of stimulating muscular fibre to resume its vital contractility, at least of that portion of the muscular system which is supplied by the cerebro-spinal nerves. It has been suggested to me by my friend and pupil, Mr. Martin, that in the exhibition of strychnine this object might be attained. This practice would be well worthy of trial, for if, as there is reason to believe, the pulmonary branch of the vagus is a nerve of motion to the lung, we might expect that the stimulation exercised by the remedy on the cerebro-spinal centres would have a beneficial effect in paralysis of the bronchial muscles.

I shall now give the general conclusions which may be drawn from what has been stated.

1st. That the disease consists essentially in an enlargement of the air cells.

2nd. That the rupture and coalescence of several cells is not a constant occurrence.

3rd. That the disease increases the volume and rarefaction of the lung.

4th. That it may occur uncomplicated with any affection except bronchitis, or exist along with other diseases, which are generally chronic.

5th. That it may co-exist with great dilatation of the tubes.

6th. That it may be partial or general.

7th. That percussion gives a morbidly clear sound when the disease has attained a certain extent.

8th. But that the cells may be so enlarged as to give feebleness of respiration without change on percussion.

9th. That the physical signs of bronchitis which occur, though pointing out the existence of disease in the smaller ramifications, are not characteristic of the affection.

10th. That the stethoscopic indication is the want of proportion between the sound of vesicular expansion, the results of percussion, and the efforts of inspiration.

11th. That a most important source of physical signs is to be found in the increased volume of the lung.

12th. That this increase of volume can be ascertained by measurement of the chest, by the displacement of the mediastinum, by the depression of the diaphragm, and by the lateral displacement, and the depression of the heart.

13th. That although in this disease, as in empyema, there is pressure from within, yet that it differs from the latter affection in the absence of paralysis of the inspiratory muscles, as shewn in the comparative states of the intercostal muscles and diaphragm.

14th. That the physical signs from auscultation are greatly modified by the degree of yielding of the thoracic parietes, the characteristic feebleness of respiration appearing to be directly as the amount of resistance to the increased volume of the lung.

15th. That in the same way the signs resulting from the displacement of the mediastinum, heart, and diaphragm, will vary with the amount of resistance of the thoracic parietes, and be more obvious the greater the resistance.

16th. That the intercostal spaces are not protruded in this disease, but preserve their relative positions with respect to the ribs.

17th. That the cases of the disease may be divided into two classes, viz. those in which the diaphragm is unaffected, and those in which it is depressed.

18th. That in the first class the abdomen is collapsed, and without tumefaction or dulness of sound in the epigastric or right hypochondriac regions. In these cases the heart is found in its natural position.

19th. That in the second class the reverse occurs; the liver is depressed, and the heart so displaced, as that it has been found to pulsate so low as the ninth intercostal space. The postero-inferior portions of the chest sound clear even to the last rib.

20th. That under these circumstances the diaphragm being flattened, its contraction acts in diminishing the circumference of the trunk in the region between the eighth and tenth ribs, so that we observe expansion of the upper portion of the chest and of the umbilical region, while the portion above-mentioned manifestly contracts.

21st. That the volume of the lung varies remarkably at different periods.

22nd. That when it is greatest all the physical signs are most evident.

23rd. That the cause of its increase is an exacerbation of the bronchitis.

24th. That under treatment calculated to remove bronchial irritation the vesicular murmur may return, and the volume of the lung is diminished.

25th. That these facts are in favour of the opinion, that the disease is susceptible, if not of cure, at least of great alleviation.*

ATROPHY OF THE LUNG.

As yet the investigations as to the general causes of this change have been very limited. The frequency of the alteration, however, has awakened attention, and, in certain cases, its causes have been ascertained. We are here, however, to investigate its relation to bronchitis, of which, as yet, but little is known. Atrophy of the lung has been recognized in a variety of diseases, such as tubercle, pneumonia, cancer, and pleurisy; but its direct connexion with bronchitis has not been sufficiently examined.

It would appear on a general view, that independent of that senile atrophy which the lung undergoes in common with other organs, the condition which is most closely connected with its morbid atrophy is impermeability. The lung indeed is of all organs that in which we might expect the most rapid diminutions of bulk from disease; for independent of the action of that law of atrophy, which operates on organs after they cease to fulfil their functions, there is a cause, as it were, peculiar to the lung, and resulting from its structure. It is easy to see that when the air tubes are obstructed, the cells to which they lead will diminish in volume. Here we see a difference in this case from that of obstructions of the circulating system. In the air tubes there are no anastomoses, and hence no collateral means of inflating the cells. These diminish, and at last disappear, and the volume of the organ must proportionably suffer.

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* In these propositions I have not alluded to the rubbing sound of Laennec, inasmuch as I feel that this point of diagnosis is not as yet established: neither have I alluded to the sign described in the text of the singular feebleness of the expiratory murmur produced after forced inspirations. Further observations are necessary on both these subjects.

Now we have seen that obliteration of the minute tubes is a common occurrence in bronchitis, and hence can understand how this disease may produce atrophy of the lung. It is plain, however, that we here take bronchitis in its most extended sense, and consider it as a disease almost of the parenchyma. It seems more than probable that in this way we can explain the rapid atrophy of the lung in phthisis, the close connexion of which with bronchial obliteration has been so well demonstrated by Reynaud. Here it would seem that the obliteration of a number of minute tubes was an early effect of the disease, and the tubercular accumulation and atrophy of the cells its direct consequence.

But in the ordinary acceptation of the term, bronchitis seems a disease but little likely to induce this lesion. Indeed one of its common effects is the very opposite condition, or hypertrophy. But it would appear that obstruction of a large tube, when permanent, may be followed by atrophy, of which Andral relates an example. I have not made any observations on this subject, and shall content myself with pointing it out as a point for investigation. To the consideration of atrophy of the lung, however, I shall return when describing the physical signs of phthisis.

SECTION III.

DISEASES OF THE LARYNX AND TRACHEA.

We may consider this subject under the following heads:

1st. Acute inflammation of the larynx and trachea.

2nd. Chronic inflammation.

3rd. Specific irritations.

4th. Spasm.

5th. Foreign bodies in the larynx, trachea, and bronchial tubes.

6th. Pressure on the windpipe by external tumors.

ACUTE INFLAMMATION OF THE LARYNX AND TRACHEA.

This affection may arise either in the child or adult, but is more frequent in the former. In the child its results are generally different from those in the adult, as in the former the production of lymph is most commonly observed. It is this affection which has got the name of croup, but we find it described under other denominations. Thus, by some authors it is called the pellicular, by others the plastic inflammation of the larynx, terms which are intended to express the formation of an albuminous covering or cast of the cavity itself.

We may meet this disease under two essentially different forms. It may occur in the first place, as a primary, idiopathic, and active inflammation of the respiratory mucous membrane, in which the accompanying fever is symptomatic. In the second place, we have it *preceded by fever*, and the formation of false membranes in the pharynx and cavity of the mouth, which, by extending downwards into the glottis and larynx, produce the symptoms of croup in the advanced stage of another and totally different disease.

The greatest confusion has arisen in consequence of authors not carefully separating these two forms of disease in their descriptions of croup, and in their opinions as to its treatment. For the sake of clearness, I shall arrange their symptoms in pairs of opposite characters, distinguishing the affections by the names of primary and secondary croup.

PRIMARY CROUP.	SECONDARY CROUP.
1. The air passages primarily engaged.	1. The laryngeal affection *secondary* to disease of the pharynx and mouth.
2. The fever symptomatic of the local disease.	2. The local disease arising in the course of another affection, which is generally accompanied by fever.
3. The fever inflammatory.	3. The fever typhoid.
4. Necessity for antiphlogistic treatment, and the frequent success of such treatment.	4. Incapability of bearing tiphlogistic treatment ; necessity for the tonic, revulsive, and stimulating modes.
5. The disease sporadic, and in certain situations endemic, but never contagious.	5. The disease constantly epidemic and contagious.
6. A disease principally of childhood.	6. Adults commonly affected.
7. The exudation of lymph spreading to the glottis, from below upwards.	7. The exudation spreading to the glottis, from above downwards.
8. The pharynx healthy.	8. The pharynx diseased.
9. Dysphagia either absent or very slight.	9. Dysphagia common and severe.
10. Catarrhal symptoms often precursory to the laryngeal.	10. Laryngeal symptoms supervening without the pre-existence of catarrh.
11. Complication with acute pulmonary inflammation common.	11. Complication with such changes rare.
12. Absence of any characteristic odour of the breath.	12. Breath often characteristically fœtid.

From the consideration of these characters we must admit, that independent of minor differences, there is a broad line of distinction between these affections of the throat. In the one the windpipe is the seat of an idiopathic, primary, and highly inflammatory disease; while in the other, its affection is accidental, inconstant, and secondary to a diseased state of the pharynx, which, in its turn, is either symptomatic of, or closely connected with, a morbid state of the whole system. Yet, as I said before, the want of an accurate distinction between these affections has led to the greatest misapprehension; and we see British physicians ridiculing the opinions and treatment of the continental practitioners, and *vice versa*. The error all the while arising from the confounding of two essentially different affections. In the croup, as described by British authors, the utility of an antiphlogistic treatment has been proved by experience.

I shall then divide the disease into primary and secondary croup, and endeavour to point out somewhat more in detail the differences in the signs, symptoms, and treatment of these affections.

Primary Croup.—The symptoms of this affection are reducible to an irritation of the respiratory apparatus, in which the upper portion of the tube is severely and prominently affected. The disease has been described and generally considered, as an affection of the larynx and trachea alone; and even those who admit an extension of disease, yet look on it as accidental and unimportant, and hence have arisen certain modes of treatment, which the progress of medicine has shewn to be erroneous. The general expression of the diagnosis of this disease may be stated to be the combination of laryngeal cough, succeeded by stridulous breathing, in a patient labouring under inflammatory fever. If these symptoms have been preceded by signs of catarrh, and if the pharynx presents no morbid appearance, we make the diagnosis of acute inflammation of the larynx, which may terminate, in some cases, by an effusion of serum into the submucous cellular tissue, but in most instances is followed by the exudation of lymph. Should the disease occur in the child, there will be a strong probability in favour of the latter result.

Three stages of this affection have been noticed by the best authors; and although they are not always distinctly marked, yet they are so frequently observed that it is necessary to notice them briefly. The first has been termed the catarrhal, the second the confirmed, and the third the suffocative stage. In the first, we have often merely the signs of a slight bronchial irritation, in which there is nothing that could lead us to anticipate so formidable a termination. In other cases, however, a little hoarseness, or a peculiar resonance of the cough may excite alarm, but there is no stridulous breathing, or sign of mechanical obstruction in the windpipe; nor is there any circumstance connected with this precursory irritation which can distinguish it from the more ordinary forms of bronchitis.

The duration of this stage is exceedingly various; it may continue but for two or three hours, or last as many days, when the second or confirmed stage sets in, characterized by a great increase of fever, anxiety, and distress, *and by indications of mechanical obstruction in the larynx itself.* Indeed one of the most remarkable circumstances connected with the disease is the rapidity with which this latter symptom shall occur, a fact strongly confirmatory of the opinion, that the mere effusion of lymph is not the principal cause of the obstruction, but that it is owing to the inflammatory spasm of the part; an opinion to which I have no hesitation in subscribing, inasmuch as we find the symptom of stridulous breathing coming on suddenly, and at a period too early for us to suppose that lymph had formed; and also that after death the aperture of the glottis is almost never found completely obstructed. Indeed Dr. Cheyne states, that, in almost all cases, three-eighths of the glottis are found pervious, *post mortem;* so that in explaining the sudden death, we must refer to a spasm of the glottis.

The symptoms of the confirmed croup in the child have been so accurately detailed by authors, and in particular by Cheyne and Porter, that I shall not occupy much space in describing them, feeling that I shall do more justice to the subject by referring to the writings of these distinguished pathologists. Suffice it to say, that all the phenomena point out the existence of an acute inflammation, with mechanical obstruction to respiration, as shewn by the fever and increasing stridulous breathing. As the disease advances there is excessive anxiety, slow and convulsive respiration, loss of voice, distressing cough, and scanty expectoration; and if the patient is not relieved, he sinks in a collapsed and comatose state.

In a few cases casts of the air passages have been expelled by coughing, with relief to the symptoms. Such instances, however, are exceedingly rare.

There can be little doubt that croup, properly so called, is a simple inflammatory disease. We observe it arising from the same cause as other internal inflammations, accompanied by inflammatory symptoms, frequently complicated with other inflammatory diseases of the respiratory system, and yielding to ordinary antiphlogistic treatment. One of the most remarkable circumstances in its history is the fact of its being more prevalent among children than adults. Indeed it appears that pure croup is rarely met with after the age of puberty, a fact the more remarkable, as we know that although in the adult, chronic irritations of the larynx are more frequent than the acute, yet that the latter form does often occur. Its results, however, are different; and the formation of lymph in idiopathic laryngitis seems peculiarly connected with the general conditions of childhood, or, at all events, with that imperfectly developed state of the larynx which precedes the period of puberty.*

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* As yet no satisfactory explanation of the greater frequency of croup in the infant has been given. Yet of the fact of this greater frequency experience does

But croup has been described as occurring in the adult. Here we again see an example of the confusion which has arisen from not carefully separating the primary and secondary

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not permit us to doubt. And we know further, that the observation applies to the young of other animals, as well as to that of man. Can we, by combining physiological with pathological considerations, throw any additional light upon this obscure point?

We have here a disease in a young animal, in which there is an albuminous product, assuming the form of the organ which has given birth to it, and so far we may observe an analogy with the reproductive powers of the invertebrated animals, and the same phenomenon in the white tissues of the higher organizations. Here I shall quote from Dr. Graves.

"The white structures of the higher animals resemble the solids of white-blooded animals, and not only in health, but disease. Thus the power of *reproduction* of parts destroyed by accident or disease, so remarkable in the lower orders of animals, is in the higher enjoyed only by white structures, such as cellular membrane, for proper muscular fibre when once destroyed is not reproduced, condensed cellular membrane being employed to repair solutions of continuity, in this as well as all more highly organized tissues.

"In white-blooded animals, we often see a new limb appear in the place of one destroyed by accident, and in man it is not unfrequent to observe a *new white organ* produced when the old has become useless, or been destroyed. Thus in unreduced dislocations, we have new bursæ mucosæ, capsular ligaments, synovial membranes, &c. produced so as to form almost all the appendages necessary either to the strength or motion of the new joint. The same happens in ununited fractures. Cartilage is thrown out to supply the place of bone removed by operation or disease, and under favourable circumstances, this cartilage itself becomes ossified, and, as happens in Necrosis, an entirely new bone is sometimes produced. In all such cases, the mould of the bone, or that part of it to which the new bone owes its form and bulk, is composed of a white structure, chiefly coagulated albumen: this is first formed, and afterwards the bony particles are deposited in it from red vessels.

"This facility of reparation forms a very striking analogy between the white parts in man and other red-blooded animals, and the general structure of the solids in white-blooded animals. In point of vitality, the analogy is most striking. The white parts in man, when not inflamed, (then they for a time become red parts, and have a corresponding increase of vital energy,) enjoy but a low vitality. They are scarcely, if at all, sensible; do not possess irritability; and probably, also, the circulation of the white blood through them is much slower than forms of the disease; for, without denying the possibility of the occurrence of primary croup in the adult, it will, I think, be found, that the great majority of cases so described are not of this kind, but are examples of what I have called the secondary in contradistinction to the primary croup; a disease in which the formation of false membranes seems to point out a condition of the system the very opposite to that to which antiphlogistic measures are applicable.

I shall now return to the primary inflammatory croup of

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that of the red blood through the red parts; at least the circulation of the *white venous blood in the lymphatics* appears much less rapid than that of the red venous blood in the veins."—*A Lecture on the Functions af the Lymphatic System*, p. 19.

From these facts we are led to conclude, that the chief reproductive power in the higher classes of animals is enjoyed by the white tissues. Now the younger a child is the greater analogy does it bear to an animal composed of white solids, (see Serres, Geoffrey St. Hilaire, Andral, &c. &c.) and hence we may suppose the greater will be the amount of this *local reproductive power*. When we consider the organization of lymph effused upon serous membranes, it seems not improbable that the same might occur in the case of croup, were such a process compatible with life. Again we have seen, that of the different solids the white tissues are those in which the reproductive power is most commonly seen; and it is a remarkable fact, that the portion of the respiratory apparatus most liable to croup is that in which cartilage is most predominant; and that as we recede from this point the plastic inflammation becomes less and less developed. How commonly we observe, in cases of croup, that in the larynx there exists an exact cast of the tube, that in the trachea this degenerates into a puriform exudation, and that in the bronchial tubes we have nothing but a mucous secretion. In the child too there may be a greater relation between the physiological and consequently the pathological states of the mucous membrane of the larynx and trachea, and their subjacent tissues, than in the adult; and the same condition which determines the progressive development of the larynx up to the period of puberty, may also predispose the mucous surface to the plastic or formative irritations.

I wish to be understood as putting forward this view merely as a subject for investigation, and am fully aware of facts, which seem at first view, at least, to bear against it; as, for instance, the formation of false membranes in the diphtheritis of the adult, and also in certain enteric irritations. But the subject is one which deserves a further and an impartial inquiry.

children. Here one of the most important considerations is *the complication with inflammation in the remaining portions of the respiratory apparatus,* a fact of vast importance, and one by no means sufficiently recognized by medical men. In a considerable number of cases the laryngitis is preceded by some inflammatory affection of the lung, which continues during its progress, but which is overlooked in consequence of the prominence of the croupy symptoms. I have little doubt, that many children that die with symptoms of croup, are carried off as much by disease of the lungs as by that of the larynx and trachea; for I have seen many instances in which, during life, the stethoscope indicated unequivocally the existence of intense bronchitis or pneumonia, and have invariably found that the diagnosis was confirmed by dissection. Indeed the whole respiratory apparatus may be sometimes engaged; so that, as Dr. Cheyne observes, we may find the lung filled with mucous secretion, sometimes hepatized, and with a fluid effusion into the cavity of the pleura.

I have the notes of one remarkable case, in which it was proposed to perform tracheotomy. I saw the patient in consultation, and satisfied myself of the existence of general bronchitis, and even double pneumonia. The operation was not performed, and the patient soon afterwards sank. The dissection accurately verified the diagnosis, for we found the bronchial mucous membrane universally red, and the tubes filled with viscid and bloody mucus. The upper lobes were in the state of active congestion, and the lower red, solid, and softened, with a copious exudation of albuminous lymph upon the surface of the pleura.

On the subject of this complication Dr. Mackintosh remarks, that the occasional co-existence of bronchitis must be always kept in view when considering the probability of affording relief by the operation of bronchotomy. "I have seen," says he, "the lungs inflamed in various degrees, and almost always considerable portions are in a state of engorgement, owing, perhaps, to the mechanical impediment to respiration."*

Without denying that the mechanical obstruction of the glottis may produce an engorgement of the lung, yet I cannot help believing that this pathological state is generally the result of the pulmonary inflammation, which, often precedes, and almost always accompanies the laryngitis. My reasons for this belief are, that in many cases I have been able to detect this engorgement by physical means before the stridulous breathing was fully established; and that the changes in the lung and the effusions on the pleura are quite similar to those observed in ordinary cases of pneumonic inflammation.

PHYSICAL SIGNS OF CROUP.—It is obvious, that in cases where the disease is confined solely to the larynx and trachea, the passive signs will furnish only negative information; for so long as the lung remains free from congestion or pneumonia, the sound on percussion will continue clear. But we are not to conclude from this, that the performance of percussion is to be neglected in croup; for whether it leads to positive or negative results the information is in the highest degree valuable with respect to diagnosis and treatment. Thus, if in a case of croup we find the sound clear, we may be tolerably sure that as yet no important amount of congestion or of pneumonia has taken place, and we may modify our prognosis and treatment accordingly, while on the other hand, if we find a local or general dulness, we may be satisfied that there is something more than laryngitis, and that the cause of dulness is either an intense congestion, or hepatization, or an effusion into the pleura. Every practical man will see the importance of this investigation; and it happens fortunately that percussion can be practised with great facility in children, particularly when used over the posterior, and consequently less yielding portions of the thorax. In making this investigation, the operator must be careful not to be misled by the dulness of the lower parts of the chest, which may arise from an enlarged liver, or from the pushing up of the diaphragm by a distended abdomen; and must also bear in mind, that the præcordial region gives naturally a dull sound. I shall only add, that the value of the clearness of sound, as a ground of favourable diagnosis, is directly as the period of duration of symptoms. If pulmonary or laryngeal irritation have existed for twenty-four or thirty-six hours, the chances are, that if there was a pneumonic complication we could discover some degree of dulness.

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* Elements of Pathology and Practice of Physic, vol. i. 1831.

ACTIVE SIGNS.—I cannot agree with Dr. M. Laennec in his opinion of the inutility of stethoscopic examination in the true croup.* It is true that in the advanced stages of the disease, when the breathing is slow, difficult, and stridulous, it becomes next to impossible to distinguish the vesicular murmur, less from the sound produced in the larynx, than from the feebleness of the pulmonary expansion. But in the earlier periods of the case, and at the time too when such knowledge would be useful, we can easily determine the condition of the lung by the stethoscope. We may then hear the various bronchial rales, and accurately judge of their extent and intensity; and even in the cases with pneumonic complication, the signs of the disease, according to its stage or extent, may be easily observed.

The active physical signs, referrible to the lung, which I have had an opportunity of detecting, have been as follows: First. A diffuse sonorous rale, not so intense as to extinguish the vesicular murmur. Secondly. The same rale, but with more intensity, indicative of disease in the more minute tubes. Thirdly. A combination of the sonorous and mucous rattles, causing a loud sound, and a feeling of vibration when the hand is applied to the chest. Fourthly. The crepitating rale of pneumonia in one or both lungs; in some cases with distinct dulness of sound on percussion. I have not heard the bronchial respiration of hepatization, or the frottement of pleurisy, but there can be no doubt, that if these conditions existed before the laryngeal disease had attained its maximum, their signs would be distinctly audible. It is true, that the sound of stridulous breathing will interfere with those of the lung, but in the earlier periods this interference is by no means so great as has been represented, and a very little practice indeed will enable the stethoscopist to recognize the above phenomena, even when a considerable amount of stridulous sound exists.

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* See his Notes on the Work of Laennec, Art. Croup.

As illustrative of the opinion, that the cause of obstruction in this disease is more spasm than the effusion of lymph, I may remark, that the act of vomiting is often followed by a temporary suspension of the stridulous breathing; and that if the stethoscopist avails himself of this interval he will be able to determine the condition of the lung with the greatest accuracy, even in a case where a short time before, none, or almost none, of the pulmonary phenomena could be detected.

But in addition to the stridulous breathing, there is another cause tending to obscure the pulmonary signs. This is the violent action of the heart, the loud and rapid contractions of which may be heard over the entire chest. Yet even this does not cause any important difficulty, at least to the practised stethoscopist.

As the disease subsides the stridulous sound disappears, and we almost always observe a pretty general sonorous rale, which may cease without passing into, or becoming combined with the mucous rattle. This is particularly observed where the treatment is persevered in after the disappearance of the laryngeal symptoms.

TREATMENT.—The treatment may be considered with respect to the precursory, or catarrhal, and the confirmed stages. We have seen in many cases, that the obstruction of the larynx does not come on suddenly, but is preceded by a stage of slight irritation of the mucous membrane, generally affecting both the larynx and bronchial tubes. Now, if at this period the physician interferes with judgment, he will generally succeed in cutting short the attack. The circumstances that should excite alarm are the wheezing respiration, with slight hoarseness, and some change in the character of the cough. These symptoms may exist although the child seems cheerful and free from fever, yet be not the less premonitory of a severe laryngitis. Under these circumstances the child should be confined to his room, all stimulating food withheld, and an emetic immediately prescribed, so as to secure its full and speedy operation; for this purpose we may employ the vinum ipecacuanhæ, as recommended by Dr. Cheyne, or the tartar emetic. I much prefer the latter on account of its greater certainty and unstimulating nature, as well as from its known power of controlling bronchial inflammation. After the vomiting the child should be kept in bed, the bowels opened, he should drink warm diluents, and the exhibition of small doses of hippo will generally place him in safety.

But on the setting in of the confirmed stage our treatment must be prompt, decided, and energetic; for in most cases the ife of the patient depends on what is done in the first six or eight hours of this attack. Now the remedies on which we may place the greatest confidence are general and local bleeding, and the exhibition of tartar emetic.

In performing general bleeding we may open a vein in the arm, or perform the operation on the jugular itself; and in consequence of the turgid state of the latter vein it will be often easier to bleed from this situation than in the arm. There are some objections, however, to bleeding from the jugular vein, the principal of which is the difficulty of commanding the hæmorrhage; and it may happen, even after the most careful arrangement of the wound, that the act of vomiting shall cause a fresh discharge of blood, which may be repeated so often as to endanger the life of the patient. This circumstance alone is a strong argument against opening the jugular vein, unless when the practitioner can remain with his patient; for if from the fear of vomiting we suspend the exhibition of the tartrate of antimony, we deprive ourselves of the most powerful agent in the treatment of the disease. After the general bleeding leeches should be applied to the region of the larynx, in numbers proportioned to the age and strength of the patient, and their application should be renewed again and again, until a decided impression is made on the disease.

But though a warm advocate of the importance of general and local bleeding, yet I look on them as merely assistants to the principal remedy, which is the tartar emetic, the exhibition of which may be commenced from the very first period of the treatment; and I would advise that the medicine should be so exhibited as to produce free vomiting, at least once in every three quarters of an hour. In this state the patient should be kept for several hours, when, according to circumstances, the remedy may be given less actively. The solution which I employ contains one grain of the salt to each ounce of distilled water, and of this a desert spoonful is given every quarter of an hour, or half hour, according as the case may be. I am aware that in advocating the treatment by repeated vomiting I am at issue with a high authority on this subject, Mr. Porter, who has recommended the remedy in smaller doses, and so managed as to keep up a state of permanent nausea, without vomiting. But without at all impugning this practice, which indeed I could not do after having witnessed its success so frequently, I must declare, that I have seen more cases of marked and rapid relief where vomiting had been produced, than where the patient had been kept in mere nausea. This is the treatment which has been recommended by Dr. Cheyne, and to its efficacy I can bear the fullest testimony. That distinguished physician, in describing the treatment of the disease, advises that "the dose of tartar emetic may be from a quarter to a half grain, and this may be repeated according to its effect, and to the urgency of the attack." He adds, "that sickness ought to be excited, and hence the dose, if it have no such effect, ought to be repeated in half an hour; and if great prostration be not produced, the dose ought afterwards to be repeated hourly while symptoms of inflammation continue."*

For the introduction of this inestimable remedy in the treatment of croup, the science is indebted to Dr. Cheyne. In his essay on Cynanche Trachealis, published in Edinburgh in the year 1801, we find the treatment recommended; and it is no small evidence in its favour, that in the year 1832, after an experience greater than falls to the lot of most men, the opinions of this philosophical investigator of disease have remained unaltered. How changed would be the character of medicine, if in support of many of our remedies, there could be brought forward such evidence and such an advocate.

I shall not dwell on the mercurial treatment of croup, as I believe it to be insufficient and unnecessary. The uncertainty of the action of calomel, the difficulty of producing ptyalism in violent acute inflammations, the shortness of the period for the exhibition of the remedy, and the various injurious effects of mercurial action on the system at large, are sufficient reasons against the employment of this treatment in the croup of children; and where we have so valuable a remedy as the tartar emetic, it seems scarcely justifiable to tamper with the case by the attempt to produce mercurial action.

It is a common practice to apply a blister to the throat in the early periods of this disease, but I have no doubt that such a proceeding is fraught with danger. Here I may refer to the observations I have already made on the action of blisters in local inflammations; and with reference to the case before us, I feel happy in quoting from, and entirely agree with Mr. Porter, who declares that they cannot be resorted to at an early period without considerable risk of doing mischief. He further remarks, that "it is always hazardous to apply a blister in the immediate neighbourhood of inflammation, and particularly so if the constitution has not been previously brought down by bleeding and evacuation. In the latter stages of croup, when the lungs are congested, and there is a tendency to effusion within them, there can be no objection to try the application of blisters to the chest, but scarcely under any circumstances will they be found beneficial if applied near to the part affected."*

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* Cyclopædia of Practical Medicine, Art. Croup.

When describing the treatment of bronchitis, I dwelt particularly on the all-important practical point, that there was a period in the disease when the antiphlogistic treatment could be no longer employed, but in which we must change to the tonic and stimulating plan; and so in croup, which is but a variety of the disease, a period will arrive when we must have recourse to the stimulant and revulsive medications. The coldness of the surface, the feebleness of the respiratory efforts, the failure of the pulse, the sinking of the eye, and the pallor of the countenance, all point out that the period for depletion has passed by; and that if there be any hope it must be from the exhibition of stimulants. Wine, brandy, opium, and ammonia may be employed. Hot turpentine stupes may be applied to the chest and extremities, and now and then the reward of the *nil desperandum* practice may be unexpectedly obtained.

On the performance of tracheotomy in this disease I have little to say, more than to express my decided dissent from it. Indeed all the best authorities are now agreed on this point. Experience has shewn that the operation has failed in the great majority of cases; and it is obvious, that with our present knowledge of the nature of the disease, we can scarcely hope for good from its performance. Among other causes for failure there is one which will always exist, and which by itself is generally sufficient to explain its inutility. There is always that kind of feeling connected with a surgical operation in acute diseases, which prevents its being proposed, assented to, or performed, unless under nearly desperate circumstances, and when all other means have failed. In the case before us, the operation is performed at a time when the situation of the patient is the worst possible for success; when the nervous system has been profoundly injured, and the lungs, even though no primary complication may have existed, have become extensively congested. But in original complication with pulmonary disease, whether it be pneumonia, ordinary bronchitis, or the plastic inflammation, spreading from below upwards, we have another and scarcely less important explanation of the failure of this operation; for even after the opening into the trachea has given a temporary relief, the patient sinks from an inflammation of the lungs, which preceded or accompanied the laryngeal disease. It might be argued, that the operation has been always performed too late, but in this respect it is like that for empyema; and, in either case, will almost never be undertaken at the earlier periods of the affection. I am far from decrying the operation of tracheotomy generally; on the contrary, it must be admitted, that in many diseases it is the only mode of saving life, but every thing turns on the proper selection of the case. Thus, in the instance of foreign bodies in the trachea, of œdema of the glottis, and of other forms of disease, commencing in, and confined to the upper portion of the windpipe, where the lungs are not diseased, nor have become congested from the laryngeal obstruction, we have a set of cases in which the operation may be undertaken with a fair prospect of success, and indeed is the only means of saving the patient from a speedy death.

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* Observations on the Surgical Pathology of the Larynx and Trachea. Dublin, 1826.

I shall conclude this part of the subject by quoting from two of our most eminent authors on the pathology of the larynx, both of whom are strongly opposed to the performance of the operation. "Before having recourse," says Dr. Cheyne,

" to the operation, supposing it easy, safe, and likely to end in the extraction of the adventitious membrane, it will be proper to ask, is the false membrane in the larynx, which it is the object of this formidable operation to remove, in general the cause of the patient's death ? We apprehend not. First, because in several dissections which were long ago made, with a view of determining the effect of the membrane of croup in obstructing the larynx, it so happened that within that membrane a space was left for a current of air sufficient to support life. In these bodies the cellular substance of the lung was distended with serum, the ramifications of the bronchi were filled with puriform matter, by which the air was excluded, and the bronchial membrane was universally inflamed, thereby preventing the arterialization of the blood: the children had perished from the lungs being unable to contain a quantity of air sufficient to support the circulation, and from the bronchial membrane being unable to act on that reduced quantity. Secondly, because when the membrane of croup fully formed is expectorated the disease is generally fatal, even when all the benefits of the operation are obtained. If the disease were confined to the larynx, *then*, and then only, would bronchotomy be advisable."*

I shall next quote from the work of my friend and colleague, Mr. Porter,† a work distinguished for originality, accuracy, and extensive investigation.

" To the casual success of such an operation I would attach no professional reputation, whilst I think much character may be lost to the individual, and general obloquy heaped on the profession, by the too frequent performance of operations thus undertaken at a hazard, and almost always at a period of the disease when its efficacy (if it ever possessed any) must be exerted too late.

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* Cyclopædia of Practical Medicine. Art. Croup.

† Surgical Pathology of the Larynx and Trachea.

"But bronchotomy has in many cases of croup been successful. True—but where are the thousand and one instances to the contrary that might be brought against each single one of these? I have performed the operation myself on the child, and have seen it frequently done by others, and in no one case has the life of the patient been saved. I have known and heard of it often, but never understood that it produced a recovery; and I should suppose that my experience on the subject only resembles that of most men who have had opportunities of seeing and treating the disease. Most practitioners are fond of publishing cases of successful operations, but are not so willing to make known those of an opposite description, from an idea that these supposed failures might lower them in public estimation, but these detached and solitary expositions of fortunate surgery are calculated to produce very serious injury if they encourage others to similar attempts, in the hope of similar results. If it was possible to place a list of those cases in which bronchotomy had not proved serviceable, in array against those wherein it had seemed to be useful, it would be scarcely necessary to advance any farther argument in proof of its uncertainty; and medical men would rather turn their attention to the improvement of that internal treatment which will generally be efficacious if resorted to in time, than look for advantage in the performance of an operation from which experience holds out such slender hopes."

But the operation has been suggested with other views than merely to facilitate the entrance of air into the lung. Thus Bretonneau,* after having ascertained the value of topical applications in the diphtheritis of the pharynx, has proposed their direct introduction into the larynx by means of an opening into the windpipe, so that in this way he might attain a double object, viz. the free entrance of air, and the action of specific agents directly applied to the diseased membrane.

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* Des Inflammations Speciales du Tissu Muqueux.

Thus, in reference to a particular case, after describing certain modifications, which he proposed in the operation, he adds, "I hoped farther, by means of the artificial opening to be able to apply calomel at once on the affected surfaces, and I avow that I had great confidence in the effects of a remedy which has such remarkable effects in many ulcerous inflammations of the skin. I was also convinced, that in the case where the mercurial treatment had failed, the diphtheritic inflammation had been dissipated in all those points where the surface came directly in contact with calomel."

The case to which these remarks apply was one of what I have called the secondary croup, where the affection of the larynx and trachea succeeded to the formation of false membranes in the cavity of the pharynx, and in which the symptoms resisted treatment, so that on the seventh day they became sufficiently alarming as, in the opinion of Bretonneau, to demand the operation. The opening into the trachea was followed by relief of the symptoms, and some fragments of concretion were expelled through the canula. Eight grains of calomel were blown into the trachea by means of the canula. For the further reports of this interesting case I refer to the work itself; it will suffice to state, that the child was convalescent on the twentieth day of the disease, and the thirteenth of the operation, but for nine or ten days after the operation the situation of the patient was often extremely critical. The direct introduction of calomel was repeated three times; the mode employed being to introduce it along with water into the canula, when by the efforts of inspiration it was sucked into the trachea.

It is plain that this case is not sufficient to establish the efficacy of the direct action of calomel as a remedial agent in the disease. During the progress of the case hardly a day elapsed without the expulsion of some of the false membrane, and without denying the possibility of the specific action of the remedy, it seems more probable that the recovery was attributable to the gradual decline of the disease in a patient whose immediate death was prevented by the operation of tracheotomy. The case, however, is full of interest, and deserves a careful study.

ACUTE LARYNGITIS IN THE ADULT.—The principal difference between this and the preceding affection is in the result of the inflammation, which in place of the formation of lymph, terminates in an œdematous state of the mucous membrane and its subjacent cellular tissue. This fact has been recognized by various writers, from the time of the second Monro; and the rarity of the production of lymph in the larynx of the adult is now fully admitted; the plastic inflammation then may be considered as in some way connected with that lower development which precedes the period of puberty.

But there is another point of difference which has not been sufficiently noticed. In the adult the disease is more confined to the larynx ;* it is in reality a laryngitis, while, as we have seen, the croup of children is commonly complicated with inflammation of the trachea and bronchial tubes. And thus we have at least one reason for the much greater success of tracheotomy in the laryngitis of the adult than in that of the child. Yet lymph has been found to line the windpipe, even in advanced age, and cases of this kind have been published as instances of croup in the adult. Without denying the possibility of a primary irritation of the larynx forming lymph, even under these circumstances, it must yet be admitted, when we compare the analogous diseases of laryngitis in the child and adult, that the secretion of lymph in the latter instance is extremely rare. In the great majority of cases described under the name of croup in the adult, the affectiou of the larynx was secondary to some genera lor local affection. The exudation of lymph formed first in the pharynx, *and extended from this to the windpipe,* and the disease thus produced was what

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* Porter. Op. Cit. p. 94.

I have already described under the name of the secondary croup.

In most of these cases the disease occurred under the form of the diphtheritis of Bretonneau; in the putrid sore throat, or lastly, as an affection supervening in the progress, or towards the close of other diseases. For the most accurate researches on this subject we are indebted to M. Louis,* and a review of his cases will confirm the above positions.

In his memoir eight cases are detailed; the first is that of a robust man, aged twenty-three years, who, on the eighteenth day of a typhus fever, became attacked with pain in the throat, soon followed by the formation of a false membrane, covering the tonsils, soft palate, and pharynx. On the twentieth this membrane had become more opaque, and the voice was altered, but the respiration continued natural; in two days, however, he had the croupy voice, and brazen respiration, the breath was fœtid, deglutition impossible, and the patient soon after sunk with delirium.

On dissection the cervical glands were found enlarged, and the pharynx, uvula, velum palati, epiglottis, and larynx were lined by a false membrane.

In the second case, the patient, aged nineteen, had laboured for upwards of three months under a chronic pleurisy, when it was observed that the sputa were mixed with portions of yellow false membranes. On the following day he complained of a pain in the throat, and the posterior portion of the mouth was seen lined with a semi-transparent false membrane. Soon after this the neck became slightly swelled, the voice altered, there was extreme distress referred to the larynx. To these symptoms succeeded the vox rauca, stridulous breathing, suffocation, and death: four days having elapsed between the invasion of the diphtheritic symptoms and the fatal termination.

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* Recherches Anatomico-Pathologiques. Du Croup considéré chez l'Adulte.

The appearances on dissection, as far as the pharynx and windpipe were concerned, were the same as in the former instance.

The third case is an example of a similar disease supervening in the course of a gastro-enteritis, with a gangrenous ulceration of the right tonsil, and some œdema of the glottis. In the fourth and fifth false membranes occupied the posterior cavity of the mouth, the nasal fossæ, the larynx, and trachea. In the sixth a similar affection supervened in the last periods of pulmonary phthisis; and in the eighth they occurred during a typhus fever. The ages of these five last patients were respectively twenty-nine, sixty-two, twenty-two, thirty-two, and fifteen years. In all the cases false membranes existed in the pharynx, and the disease is admitted by Louis to have spread from above downwards. Indeed he records but one observation where this production was confined to the windpipe alone. This was a female, aged thirty-two, exhausted by misery and starvation, who died with symptoms of angina, accompanied with prostration. On dissection, a thick false membrane lined the larynx and trachea, and even descended to the third ramifications of the bronchial tubes. It did not occur on the tonsils or soft palate, where nothing was found but a small quantity of greyish-coloured mucus.

It must be admitted that these cases, excepting the seventh, were examples of a disease very different from the inflammatory croup of children. A great similarity exists among them; the formation of false membranes in the cavity of the mouth, and its spreading from above downwards; the disease, secondary to other local affections, or to fever; the prostration, the typhoid state, and the age of the patients, form a group of circumstances decisive as to the nature of the disease.

Acute laryngitis may vary from the production of but a slight hoarseness, without stridulous breathing, and with little or no fever, to a violent irritation of the mucous membrane and subjacent cellular tissue of the glottis, epiglottis, and upper portion of the larynx; an œdematous state of the mucous membrane and cellular tissue of the glottis is produced, and death results from the direct closure of the tube. Rapid and formidable from its nature and situation,—the situation of all others where the least extent of disease is the most dangerous, it demands a prompt and energetic treatment.

The disease in its worst form is characterized by a hoarse cough, with increasing difficulty of breathing; the respiration becomes rapidly stridulous; the voice is altered until it is only a painful whisper, and the distress and anxiety of the patient are extreme. There is often great dysphagia, and the drinks are returned through the nose. In these cases the epiglottis may be felt swollen, turgid, and erect, and on inspection is seen red and shining.*

This affection has been described under the name of the œdema of the glottis, but it is better in medical nomenclature to have reference to causes than effects. Besides we may have œdema of the glottis without violent inflammation.

In the advanced periods of this affection the situation of the patient is truly dreadful from the painful, laboured, and insufficient breathing, and the paroxysms of cough; his voice is too feeble to express his sufferings, but in his anxious and supplicating countenance we may read that he demands relief at any price. The eyes are staring and tearful, the face pallid, and the skin often cool. If he falls asleep for a moment he suddenly awakes in the greatest agitation, and if relief be not speedily afforded he soon sinks by coma.

The fatal termination may occur suddenly and rapidly, or more slowly, when it seems to arise from the non-arterialization of the blood. And even after the air has been freely admitted by bronchotomy, the patient may sink apparently from the shock which the brain has received.† Such a result is more likely when the operation has been long delayed.

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* See Wilson in Med. Chir. Trans., vol. v.

† See Cyclopædia of Pract. Medicine, Art. Laryngitis, by Dr. Cheyne.

An œdematous swelling of the neck has been enumerated among the symptoms of this disease, but with what degree of justice remains to be settled. I have seen the affection more often without than with this swelling; and in the cases where it did occur, it was not symptomatic of the disease, as in these patients there had been either erysipelatous inflammation, or bad scarlatina, and the swelling of the neck manifestly preceded the laryngeal symptoms.

In a patient operated on successfully by Mr. Porter, the integuments of the neck were swollen consecutively to the laryngitis; but here the swelling was from emphysema, and was a source of great embarrassment in the operation. This obviously proceeded from the violent efforts of cough and respiration, but whether the lesion took place in the lung or windpipe is not known. Louis observed a similar occurrence in a case of foreign body in the trachea.*

This formidable disease, however, may occur under other conditions than as an acute inflammatory disease. Œdematous obstruction of the glottis is an affection arising from many causes, of which the following may be enumerated.

It may occur,

1st. From acute primary inflammation, as in the form just described.

2nd. As a result of erysipelatous inflammation affecting the system generally.

3rd. From diffuse inflammation of the neck.

4th. As a result of the lower forms of scarlatina, and other exanthemata.

5th. Consequent on the disease called parotiditis, so common after fever.†

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* Med. de l'Academie de Chirurgie, tome iv.

† Of this disease I have made many dissections, and in no case was the parotid gland affected. The affection was in all an œdematous inflammation of the cellular membrane posterior to the angle of the jaw.

6th. Occurring after the long existence of organic tumours in the neck.

7th. After great operations on the neck.*

In fact it would seem likely to arise in all cases of tumour of the neck, particularly those where an irritation of the cellular membrane has occurred, and the fever may be inflammatory or typhoid.

Œdema of the glottis then is not a disease which we can always meet by a bold antiphlogistic treatment, and an accurate investigation into its causes and history must be made before its treatment can be determined on.

But besides this formidable disease, there are other acute irritations of the larynx, which differ from it in their history, symptoms, and danger.

In these following forms may be enumerated—

1st. Simple recent hoarseness, without stridulous breathing or fever.

2nd. Hoarseness and fever, with slight stridulous breathing.

3rd. Hoarseness, incessant cough; some stridor, with pain and soreness of the larynx, dysphagia, not proceeding from tumefaction of the epiglottis, occasional spasmodic exacerbations.

4th. Symptoms similar to the preceding, but occurring in the course of typhus or gastric fever, and in all the phenomena analogous to the other secondary affections of fever.

6th. Laryngeal symptoms arising in the course of the exanthematous diseases, such as measles, scarlatina, and small-pox.†

7th. Laryngeal symptoms arising from the spreading downwards of an exudation of lymph formed in the pharynx and cavity of the mouth. This is the *diphtherite tracheale* of Bretonneau,* and may be seen in cases of the putrid or malignant sore throat. The disease may only produce some hoarseness or stridor, or, on the other hand, cause death by laryngeal obstruction.

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* For these last two instances I am indebted to Mr. Cusack. In the Museum of the Park-street School of Medicine there is an excellent specimen of the disease, which occurred in a patient labouring under a cancerous tumour below the jaw; there the mechanical obstruction to the circulation had probably much to do in the disease.

† See Tweedie, Clinical Illustrations of Fever, with reference to this and the last variety. In typhus fever I have never seen the disease produce stridulous breathing.

8th. Laryngitis from the spreading downwards of the plastic inflammation, caused by the action of corrosive agents on the cavity of the mouth and pharynx.

The diseases which may be confounded with acute idiopathic laryngitis are not numerous. But in making our diagnosis we must know them so as by the method of exclusion we may form a true opinion. They may be enumerated as follows.

I. *Secondary inflammation of the larynx, arising in the course of angina maligna, diffuse inflammations, typhus fever, the exanthemata,* &c.

We distinguish this class of affections by their previous history, by the character of the fever, and by the pre-existence of signs of local disease in the pharynx, or in the cellular membrane of the neck. The occurrence of diffuse inflammation, of the exanthemata, or typhus fever, are also most important in the diagnosis.

II. *Foreign Bodies in the Larynx.*—As I shall dedicate a separate chapter to the diagnosis of this occurrence, I shall not now dwell longer on it than to remark, that in general the suddenness of the attack, the absence of fever, or other constitutional disturbance, the healthy state of the epiglottis, while the signs of obstruction are increasing, the singular remissions, and the completely characteristic stethoscopic phenomena, are sufficient to lead to an accurate conclusion.

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* Des Inflammations Speciales du Tissu Muqueux, par P. Bretonneau, Paris, 1826. This author has described a remarkable epidemic of this affection, which occurred at Tours in 1818. To the original disease he gives the name of the scorbutic gangrene, or angina maligna. He gives the dissections of eighteen cases, in which the air passages were engaged. In five, the disease occurred in children aged from eight months to seven years, and in them all the exudation was first formed in the pharynx. In one case it descended into the minute bronchi. The remaining thirteen cases present the disease (with a single exception) proving fatal by attacking the air passages, and in the great majority first engaging the pharynx. In one case the laryngo-bronchial membrane seemed alone affected.

III. *Acute Pericarditis.*—In a few instances this affection has simulated laryngitis remarkably.* In most of them, however, the pharynx and epiglottis have been found healthy, and the disease was longer in running its course than the ordinary acute laryngitis of adults. If to these we add the fact, that the diagnosis of pericarditis no longer rests on negative evidence, we have sufficient means to prevent our confounding the two affections.

IV. *Acute Pneumonia and Pleuritis.*—These diseases are not so liable to simulate laryngitis as the last. As to diagnosis I shall only say, that the physical examination of the chest, which should never be omitted in any case of laryngitis, will, in almost all cases, suffice to establish the distinction.

V. *Aneurismal Tumours compressing the Larynx.*—The chronicity of these cases, the absence of fever, and the existence of pectoral disturbance, such as pain, palpitation, dyspnœa, and cough, long before the laryngeal symptoms set in, will generally point out their nature. But there are other circumstances which must be attended to. Thus we may observe the tippet-like swelling of the neck,† the tumefaction of one or both jugular veins, and the occurrence of *deep seated* dysphagia. The upper portion of the sternum and one clavicle will be generally dull on percussion, and the stethoscopic signs of aneurism will be here audible. Lastly, if the patient has been under observation previous to the setting in of laryngeal symptoms, *and that we have discovered a more than natural difference between the intensity of the vesicular murmur in either lung, while there is no physical sign of disease in these organs*, we may be certain that the obstruction was not originally in the windpipe, but first affected one bronchus, and from that extended upwards.

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* On the curious fact of this and the two next affections simulating laryngitis, I shall dwell more fully when I treat of pericarditis. See Morgagni, Epist. Med. xvi. Art. 40. Also J. P. Frank de Curand. Hominum Morbis. Testa, de la Malattié del Cuore, Bologna, 1811, vol. iii. And lastly, Portal, Mem. sur la Nature et le Traitement de Plusieurs Maladies, Paris, 1819.

† Dub. Jour. of Med. and Chem. Science. On the Diagnosis and Pathology of Aneurisms of the great Vessels, by W. Stokes, M. D., vol. v.

VI. *Abscesses external to, and compressing the Larynx.*

These affections may be recognized and distinguished from laryngitis by local tumefactions in the superior portion of the neck, which are tender to the touch, and cause an inability to open the mouth. From the confinement of the matter under the strong fascia of the neck fluctuation is seldom perceived, but an œdematous condition may exist. According to Mr. Porter,* the difficulty in breathing, though great, does not resemble that occasioned by laryngeal obstruction, it is not sibilous or whistling: the approach of the suffocating symptoms is in general gradual, and there is no appearance of inflammation in the fauces. Further, as the above author has observed, we find that in pressing the larynx backwards against the spine, a feeling of fulness and elasticity is often imparted, and when we move the organs laterally, the sensation of the rubbing together of two firm substances is no longer produced.

VII. *Spasmodic Exacerbations in Chronic Laryngitis.*

It is scarcely necessary to dwell on this case as distinguished from acute laryngitis; for the previous history, the suddenness of the attack without increase of fever, and the condition of the fauces, will at once enable us to determine the nature of the symptoms.

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* Porter. Op. Cit. pp. 127, 130.

VIII. *Hysteric Spasm.*

Like the preceding, it is generally easy to distinguish the nature of this attack. It most commonly occurs in females, who have already shewn a manifest hysterical or spasmodic tendency. It is generally accompanied by other hysterical symptoms; and though the obstruction seems excessive, yet the patient is free from fever. On the subject of spasm of the glottis I shall hereafter dwell more fully.

PHYSICAL SIGNS OF LARYNGITIS IN THE ADULT.—I shall defer the consideration of this subject until we examine the history of chronic laryngitis. I do this in order to avoid repetition, for the causes and nature of the physical signs are nearly similar in both diseases.

TREATMENT OF ACUTE LARYNGITIS IN THE ADULT.—There is abundant evidence to shew that in a certain period of the idiopathic disease we may succeed in reducing the inflammation by vigorous antiphlogistic treatment. It is hardly necessary to observe, that this treatment is only proper or safe in the earlier periods, while the strength of the patient is but little impaired, and particularly while the blood is sufficiently arterialized. But after long-continued stridulous breathing, or even when it is recent, but severe and increasing, and when we find the countenance waxy or livid, and the lip pale, it becomes nearly useless, and often dangerous, to draw blood.* Then we must not lose time, but give the patient his best chance, namely, the performance of tracheotomy. There is no disease of an inflammatory nature in which the period for antiphlogosis is so short; for the result is generally œdema, and the organ, as compared with others, that in which the least amount of tumefaction or effusion causes the greatest depressing effects.

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* See Cheyne, Cycl. of Pract. Medicine, Art. Laryngitis. Also Armstrong, Practical Illustrations of Typhus Fever. Porter, Surgical Pathology of the Larynx and Trachea. p. 101. Dr. Cheyne remarks, after detailing some successful cases of blood-letting in laryngitis, that in none of them had lividity occurred; and also, that where bleeding is performed, it should not, as Baillie has advanced, be carried so far as to cause syncope.

In the milder forms of the disease we may often apply leeches with benefit, but I have seldem seen them of advantage in the more violent cases. Dr. Cheyne has suggested that they should be applied to the mucous membrane, as near as possible to the epiglottis; and certainly this mode would be that most likely to afford relief if such is to be obtained by local bleeding.[†] With respect to blistering, there is as yet no evidence in its favour as a remedial measure in this disease.

In fact if the inflammation does not yield to the early and vigorous use of the lancet, the operation of tracheotomy must not be delayed; and it is consoling to know that it affords an excellent chance for recovery. And further, that even under circumstances apparently the most hopeless, it may be successfully performed. In a case quoted by Dr. Cheyne, the operation was performed by Mr. Goodeve, after the pulse had ceased at the wrist, the face suffused, and the lips livid, yet recovery took place. I shall not soon forget the case of a gentleman, aged upwards of sixty years, who had recently recovered from a violent pneumonia, and was attacked with the most violent form of acute laryngitis, which baffling all efforts to control it, brought the patient into the jaws of death in little more than twelve hours. It was determined that Mr. Porter should be sent for to operate, but before he arrived the patient had become nearly insensible. The operation was proceeded with, but respiration ceased before the trachea was opened. The operator paused, it was a fearful moment, and then rapidly opened the trachea, yet no sound of inspiration followed. Applying his mouth to the wound he inflated the lungs, and produced artificial respiration

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[*] See a paper on the Application of Leeches to Internal Surfaces, by P. Crampton, M. D., Dub. Hosp. Reports, vol. iii.

at least seven times, when a loud and rattling inspiration, followed by full and free breathing, proclaimed the triumph of art. The occurrence, strange and unexpected, excited at the moment feelings of a higher order; and among those who participated in them there was none more sincerely affected than the intrepid, experienced, and scientific operator himself.

In these cases it sometimes happens that the obstruction rapidly subsides after the operation; but in many others it is necessary to insert a canula, so adapted that it may be worn for a length of time. For further information on this point I beg again to refer to Mr. Porter's book, and shall conclude by observing, that general or local antiphlogistic treatment seems inefficacious in all the forms of œdema of the glottis excepting the first; how far the performance of the operation may be trusted to in such cases must be determined by future experience.

Finally, it is be remarked, with respect to those milder forms of laryngitis, in which the disease seems to consist of a slight thickening of the mucous membrane, that the best treatment consists in enjoining silence and repose, in the repeated application of leeches in small numbers to the part, in the use of mild diaphoretics, and lastly, in the exhibition of mercury, in moderate doses, so as gently but decidedly to affect the system. During this treatment the strength of the patient is to be supported by a mildly nutritious diet; and if he has been accustomed to the use of wine, or spirituous liquors, we must (particularly if it be necessary to draw much blood by leeching) allow him a certain proportion of his accustomed stimulus.

The necessity of this will be admitted by any practitioner who has had to treat the embarrassing complication of laryngitis, with delirium tremens from exhaustion, or deprivation of the usual stimulus. I have seen a case of this kind, and can hardly conceive a more unfortunate complication; for the loquaciousness and excitement of the patient is peculiarly hurtful in a disease in which silence and repose are so absolutely necessary.

CHRONIC DISEASES OF THE LARYNX AND TRACHEA.

Under this denomination are included a number of chronic diseases, affecting the innervation, the mucous membrane, and the more deep seated tissues of the larynx. The greatest variety exists in the characters, consequences, and complications of these affections, and I shall not attempt to give more than a sketch of the subject.

Like the preceding form, we may have chronic irritation of the larynx as an idiopathic disease, or depending on some specific condition of the system. In the first instance we see it arising from the ordinary causes of internal disease in an uncontaminated constitution, while in the second it is met with as a result of syphilitic or scrofulous disease, and often combined with chronic affections of the lung.

The effects of chronic irritation on the larynx vary from a slight vascularity and thickening to changes so extensive as to completely obliterate and destroy the natural appearance of the cavity.

These changes may be enumerated as follows:

1st. Slight thickening, with or without vascularity of the mucous membrane.

2nd. Purulent secretion from the surface, secretion of lymph confined to the larynx, and combined with ulceration of the mucous membrane.

3rd. Hypertrophy and schirrous induration of the submucous cellular tissue.

4th. Atrophy and softening of the internal laryngeal muscles.

5th. Purulent, tuberculous, or serous infiltration of these muscles.

6th. Softening of the ligaments of the larynx.

7th. Linear contraction of the ventricles.

8th. Enlargement and thickening of the epiglottis.

9th. Expansion and thinning of the epiglottis.

10th. Contraction and shrivelling of this cartilage.

11th. Superficial ulcers of the laryngeal face of the epiglottis.

12th. Ulcerous destruction and removal of the epiglottis.

13th. Superficial ulcerations of the rima, and mucous membrane of the larynx.

14th. Deep irregular ulceration of the ventricles.

15th. Defined ulcers of the ventricles.

16th. Ulcerative destruction of the arytenoid and other cartilages.

17th. Spreading ulceration of the mucous membrane, with warty excrescences.

18th. Sub-mucous abscess of the larynx.

19th. Abscess of the ventricles.

20th. Abscess around the cricoid.

21st. Mortification of the cricoid.

22nd. Mortification of the thyroid cartilage.

23rd. Ossification of the cartilages.

24th. Ossification of the epiglottis.

25th. Caries of the ossified cartilages.

26th. Phosphatic concretions in the ventricles.

27th. Cauliflower vegetations of the larynx.

28th. Tubercle of the larynx.

29th. Warty excrescences.

30th. Cancer of the epiglottis and larynx.

31st. Hydatids.

In commenting on these various alterations I need scarcely remark, that in many instances several of them may occur in the same case, either primarily or consecutively. A simple mucous inflammation may in one patient be followed by changes very different from those in another ; and nothing can be more various than the combinations of morbid alteration which may thus arise.

Slight Thickening and Vascularity of the Mucous Membrane.—I have placed this condition the first in the list, as it represents the simplest form of the disease. Its symptoms are in general a slight degree of hoarseness, both of voice and cough, some soreness on pressure, and slight dysphagia. When recent, and occurring in a healthy constitution, it will generally yield to a mild antiphlogistic and mercurial treatment; but when chronic, or when it arises in the scrofulous constitution, whether that be remote or acquired, it becomes a most serious disease.

But this disease may exist in the trachea without producing even the symptoms above-mentioned. In fact, of the whole tube, this portion seems the least sensible, a fact proved by the phenomena of disease, and also by those of foreign bodies in the trachea. I have seen many cases of a chronic inflammation of the trachea, in which the diagnosis was made on negative grounds, there being no evidence of laryngitis on the one hand, and no symptoms or signs of bronchitis on the other.

The expectoration was mucous or muco-puriform; and in several cases a tenderness of the tube on pressure existed. In these cases treatment directed to the trachea had the best effect. Louis, however, has observed, and I can corroborate the assertion, that where the irritation is acute, heat and pain are felt along the course of the tube. His observations were made in cases of phthisis.*

Purulent Secretion from the Surface.—We consider this affection in its simplest form, occurring independent of any structural change, except perhaps thickening and vascularity. But under these circumstances it is exceedingly rare, so rare, indeed, that the co-existence of laryngeal symptoms with purulent expectoration may be looked on as almost decisive of ulceration of the larynx, or what is more common, of this combined with tuberculous ulceration of the lung. In certain cases, however, it arises from the opening of abscesses into the larynx, which have followed upon disease of its cartilages.*

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* Louis, Recherches, Anat. Path. sur la Phthisie, p. 385.

Hypertrophy and Induration of the Sub-mucous Cellular Tissue.—This interesting form of disease has been met with in cases of chronic irritation of the larynx, when it materially interferes with the action of the muscles both of phonation and respiration: when it affects the epiglottis, the form and volume of the organ are changed, and dysphagia produced.†

It will probably be found that this form of disease coincides with ulcerative affections of the canal. I have seen it most remarkably in a case where ossification and caries had affected both the laryngeal and tracheal cartilages, and the hypertrophy extended from the larynx down to the bifurcation.

Lesions of the Muscles and Ligaments of the Larynx.—Of the pathological anatomy of laryngeal disease this is the portion which has been most neglected. Andral has noticed the atrophy and softening of the muscles, and has found them infiltrated with mucus, pus, or tuberculous matter. Softening may also affect the ligaments, and thus cause important alterations in the voice. This author describes the softening and degeneration into an inorganic pulp of the thyro-arytenoid ligaments, which ultimately disappear, leaving the muscles bare.

On this subject the same author observes, that in certain cases of complete aphonia no lesion whatever could be discovered on the internal surface of the larynx, but that on examining the fibres of the thyro-arytenoid muscle he found them atrophied and separated by morbid depositions either of pus or tubercle.‡

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* Porter, Op. Cit. p. 134.

* Andral, Precis d'Anatomie Pathologique, tom. ii., part ii.

‡ Ibid, p. 494.

But the action of disease in destroying the tension of the whole fibro-elastic expansion of the internal surface of the larynx, must have a powerful effect in causing alterations of the voice. Professor Lauth has well remarked that this tissue fulfils a special function, namely, to increase the sound by its vibrations; so that in the larynx there are two sounding boards, one external, cartilaginous, elastic, and but little moveable, the other, internal, but thin, supple, moveable, yet elastic.*

In connexion with this subject, the following case, which is recorded by Dr. Graves, possesses the greatest interest. I shall give it in his own words.

" A young gentleman of delicate constitution, and who is now about sixteen years of age, continued to enjoy tolerably good health up to his sixth year. When about six years of age, he went to bed one night in health, and without any unusual symptom, but, on getting up in the morning, it was observed that he had lost his speech, and was unable to articulate a single word. His family became alarmed, and sent for a physician immediately; the boy got some internal medicine and a stimulant gargle, and recovered his speech in a few days, without the occurrence of any symptom of laryngeal inflammation or cerebral disease. But what was remarkable in the case was this: the boy, who up to this period had spoken well and distinctly, now got a terrible stutter. This resisted all kinds of treatment, and for ten years he continued to stammer in the most distressing way, and was so annoyed by it himself, that when a boy he used to stamp on the ground with vexation whenever he failed in uttering what he wished to express. In the month of May last he got an attack of chronic laryngitis of a scrofulous character, and evidently the precursor of phthisis. Indeed he is at present labouring under phthisis; Dr. Stokes and

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* Remarques sur la Structure du Larynx, &c. Mem. de l'Academie Royale de la Medecine.

I have examined him, and we feel convinced that tubercular deposition is going on in the lungs. But what is most curious in the case is this—after he got the laryngitis, a very peculiar change took place; the laryngeal inflammation modified the tone of his voice so as to make it it a little husky, but *the stammering has completely ceased*."*

In this case Dr. Graves supposes that the alteration in structure or vitality of the mucous membrane covering the delicate muscular fibres, so modified the disposition of the parts, as to render them incapable of undergoing those rapid contractions necessary to produce stammering, by closing the glottis at the moment it should remain open. On this interesting point further observations are necessary. It is obvious that morbid anatomy and pathology have not been sufficiently applied to the subject of phonation. The field is open, and promises a rich harvest.

Linear Contraction of the Ventricles.—In this condition, which I have found to be exceedingly common in a variety of chronic diseases of the larynx, the ventricles are narrowed in the transverse direction; so that in the more advanced stages of the disease they are represented merely by a depressed line. This seems to arise from the thickening and approximation of the edges of the cavities; and it is not improbable that this approximation may be in part owing to a paralyzed condition of these muscular fibres, which act in dilating the ventricles. A condition similar to that of which I have already spoken, as affecting the circular muscles of Reissessen, probably occurs also in the larynx, and by the paralysis of those portions of the thyro-arytenoid muscles, which dilate the ventricles, their cavities become gradually obliterated.

Morbid States of the Epiglottis.—The simplest form of disease of the epiglottis is its enlargement and thickening.

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* London Medical and Surgical Journal, No. 174, vol. vii. Clinical Lectures delivered at the Meath Hospital.

We have seen what an important share this condition has in the phenomena of the acute laryngitis of the adult; yet in the more chronic forms, although the lesion occurs to a certain degree, it is more an hypertrophy of the epiglottis than a mere œdema, and I have never known it to produce such symptoms as dysphagia or stridulous breathing, although Andral states that it may produce the first of these symptoms. In the acute laryngitis of the adult a sudden tumefaction occurs, which may subside with equal rapidity;* but in the chronic disease this increase of thickness goes on slowly, and not to the same degree as in the acute form.

Strongly contrasted with this lesion is another, which may be described as its opposite; I allude to a condition which I propose to call the leaf-like expansion of the epiglottis. This has not been described by any author, but a most remarkable preparation of the disease exists in the Museum of the School of Anatomy and Medicine in Park-street. The epiglottis is thinned, and singularly elongated, and its form so altered, as to represent the shape of a battledore, the narrow extremity being next the glottis. In the preparation alluded to, it is fully two inches in length, and coincides with double perforating ulcers of the ventricles. Nothing is known as to the history of the case, but I have seen more or less of a similar alteration in other cases of laryngeal disease.

We have next to consider the contraction and shrivelling of the epiglottis, and its ulceration. The first of these conditions is by no means uncommon, and the organ assumes a crescentic shape, with the concavity looking upwards; I have never seen it without ulceration, and other organic disease of the larynx. We are still, as in the preceding case, ignorant of the symptoms which this condition would produce.

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* Thus in a patient operated on in the Meath Hospital, the tumefaction of the epiglottis subsided so rapidly, that within a few hours after the operation, respiration could be performed through the glottis, and the enormously swollen epiglottis was no longer visible.

The laryngeal surface of the epiglottis is very liable to ulcerate; but as a simple disease this form is seldom seen. Combined in most cases with organic disease of the larynx and lung, it becomes difficult to study its symptoms separately, and indeed its constant complication with disease of the rima seems to preclude such an analysis.

These ulcers are generally small, irregularly circular, and with little depth, giving a cribriform appearance to the epiglottis.

In a remarkable case, which fell under my observation, the patient, an adult man, suffered for a great length of time under the worst form of tussis ferina. No disease could be discovered in the fauces, the voice was but little affected, and there was no stridor, except during the paroxysm. The disease resisted every treatment, and after continuing for nearly a year, the patient sunk from an attack of dysentery. On dissection, we found numerous small yellow ulcers, with raised and indurated edges, affecting the whole of the laryngeal face of the epiglottis. There was no other perceptible disease of the respiratory system.

In M. Louis' celebrated work on the Pathology of Phthisis, we find the subject of ulceration of the epiglottis handled with that spirit of philosophical research, which so distinguishes the learned author. In all his cases the patients laboured under tuberculous disease of the lungs; but as some of them presented no perceptible lesion of the larynx or trachea, the symptoms having reference to disease of the epiglottis may be studied with advantage. I shall give the general results in his own words.

"Of eighteen cases, which fell under our observation, there were six in which the larynx and trachea were free from disease. Among these four of the patients complained of pain, more or less violent, occurring in the superior part of the thyroid cartilage, or between this cartilage and the os hyoides. This pain was compared to the sensation of a sore, to a pricking feeling, or a heat in the part; and in some cases it had lasted for a month or two, while in others it occurred but a few days before death. In these cases, although the pharynx was healthy, there was difficult deglutition, the drinks sometimes even coming through the nose."

"Of the twelve patients, who had at once ulcerations in the epiglottis, larynx, and trachea, there was dysphagia, and pain in some cases, and in one the drinks were partly returned through the nose."

"Thus we are led to conclude, that the symptoms of ulcerations of the epiglottis are a fixed pain either in the superior portion of, or immediately above, the thyroid cartilage, difficulty of deglutition, and the return of drinks through the nostrils."*

But the epiglottis may be entirely destroyed by ulceration, with or without destruction of the root of the tongue. Of this disease there are many curious examples in the Park-street Museum. In some of these the disease was cancerous.

Ulcerations of the Larynx.—Considered merely in an anatomical point of view, it may be seen that the greatest variety exists in the size, number, seat, and complications of these ulcerations. In fact, the disease may vary from a slight abrasion, or minute follicular ulceration, to such a destruction and defacement of the cavity, as that its natural appearance is altogether destroyed. The disease may further vary in its exciting cause, as in some it is traceable to a syphilitic origin; in others, to a scrofulous; while in a third, it results from inflammation in an apparently uncontaminated constitution.

I shall not enter at any length into the history of laryngeal ulceration, but shall merely dwell on some points not generally understood.

One of the simplest forms, and which may be an idiopathic affection, is the existence of small ulcers immediately below the rima, and not extending far into the cavity. This disease is accompanied by a secretion of lymph, and is a chronic and apyrexial affection; and as its principal symptom is a violent and apparently spasmodic cough, it is often mistaken for pertussis, or other nervous affections of the larynx.

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* Recherches Anatomico-Pathologiques sur la Phthisie. Paris, 1825, p. 255.

We are not in possession of facts to enable us to state whether there exists any fixed *anatomical difference* between the specific ulcerations of the larynx. It is a difficult question, as many of the cases have occurred in constitutions in which the destructive influences of scrofula, syphilis, and mercury have been united. In the preparations of the Park-street Museum, however, those which seem to have been simply syphilitic, present spreading ulcers of the mucous membrane, or a cribriform condition; but in both instances *combined with warty excrescences*, which so far seem peculiar to the syphilitic disease.

In the phthisical ulceration of the larynx I have never seen these warty tumours; here the common form is a deep ulceration occupying each ventricle, or a number of minute superficial ulcerations affecting the ventricles and cordæ vocales. Of these forms, however, the first, in this country at least, is by far the most frequent. Indeed, in cases of phthisis pulmonalis, when in the advanced stages the voice becomes hoarse, and the breathing and cough laryngeal, we may diagnosticate this ventricular ulceration with almost complete certainty. In one case, however, that of a deaf and dumb man, the ulcers did not affect the ventricles, but occurred immediately below the rima. To this subject I shall presently return when describing the physical signs of laryngeal disease; and shall merely mention here, that the symptoms vary from a slight hoarseness to complete aphonia. There is seldom a great degree of stridor, but pain, soreness, and dysphagia are commonly observed. Hectic fever and purulent expectoration are present in most cases, but their source, in the great majority of instances, is the tuberculous and ulcerated state of the lung itself. Indeed what is called phthisis laryngea seems to be, in almost all cases, phthisis pulmonalis; the affection of the windpipe being, in a few cases primary, but in a far greater proportion secondary to tubercle of the lung. How much of suffering to the patient, and disgrace to the physician, would be obviated, were the truth of this more generally recognized.

Ulcerations of the Trachea.—These have been but little studied as yet. It may be remarked, however, that though much less frequent than the two last varieties, they are often met with, and occur with or without disease of the cartilages. Louis states that in phthisis the site of the ulcerations is commonly along the musculo-membranous portion of the tube, a fact, which he seeks to explain by referring to the irritating action of the expectorated matter. Without wishing to defend or adopt this doctrine, I may mention a fact strongly corroborative of it: I have in numerous cases, where a chronic phthisical abscess existed in the lung, observed that ulcerations were found towards the bifurcation of the trachea; these could be traced to the first division of the bronchus, when they became only perceptible in one tube, which in all cases, *was that leading to the excavation.* In other instances, where one lung was full of ulcerous cavities of some standing, while the other only contained crude, or recently softened tubercle, I have found ulcerations in the trachea, evidently extending upwards from the bronchus of the excavated lung. These ulcerations were numerous, while, in the opposite tube, not even an abrasion could be found.

The cure of extensive ulceration of the trachea by cicatrization, has been observed by Mr. Porter. The patient recovered under the use of mercury, and after enjoying good health for upwards of a year, died of another disease. On dissection, an extensive but perfect cicatrix was found in the upper portion of the trachea.*

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* Of these ulcerations of the epiglottis, larynx, and trachea, M. Louis observes, that they are twice as frequent in men as in women; and that facts lead to the conclusion, that they are almost peculiar to phthisis.—Louis, Op. cit.

On the remaining diseases of the larynx and trachea, and in particular those affecting the cartilages, I shall not offer any observations, feeling that in so doing I could only repeat what has been already said by others. On this subject I would refer the reader to the works of Porter, Andral, and Cruvelhier, but in particular to the first. The diseases of these important portions of the respiratory apparatus were but little known previous to its appearance, and to the author is due the merit of first describing the mortification of the laryngeal cartilages, a disease even still by no means sufficiently recognized by pathologists.

To enter into a description of the symptoms observed in these various cases of disease would far outstrip the limits of this work. It is sufficient to observe, that although possessing some general similarity, they vary in many particulars. The symptoms in general consist in various alterations of the voice; cough of a distressing, loud, and peculiar character, with or without expectoration, which may be mucous or purulent; and signs of mechanical obstruction about the glottis. Of this last symptom it may be remarked, that it is exceedingly various. Thus, in some cases, the stridulous breathing goes on increasing to suffocation, while in others, even until the fatal termination, it is so slight as to be scarcely perceptible. In one point of view, the existence or absence of this symptom has a great practical importance, namely, in determining the condition of the lung. We shall find that much of the facility of this diagnosis turns on the amount of the mechanical obstruction to respiration; that where it is prominent a stethoscopic examination of the lung becomes next to impossible, while it is not prevented by extensive laryngeal disease, so long as the entrance of air is not materially obstructed.

I shall first examine the physical signs of chronic laryngitis, and then point out the mode of diagnosis, when the question of pulmonary complication is to be determined.

PHYSICAL SIGNS OF CHRONIC LARYNGITIS.—Although this part of physical diagnosis has been neglected, yet we may derive advantage from its investigation; for I have seen, in cases of laryngeal disease, enough of variation, both in the passive and active signs, to persuade me of the importance of the subject.

The sound on percussion of the healthy larynx, has a peculiar hollow character, which does not convey that idea of depth or elasticity given by the pulmonary sound. The best mode of examining it is to throw the head back, so as to stretch the neck, and the head being then supported by an assistant, we may use mediate percussion over the thyroid and cricoid cartilages. A good mode of percussion is to place the back of the nail of a finger on the pulp of the thumb, and to make a fillip on the part.

The laryngeal sound is loud in proportion to the development of the larynx; and it may be observed to vary in the same individual, being loudest when, from the raising of the soft palate, the communication between the glottis and cavity of the mouth is free.* The point where it is loudest is exactly that selected for the operation of laryngotomy, namely, the space between the cricoid and thyroid cartilages.

I have not made sufficient observations to announce the alterations in this sound produced by disease; but I have seen enough to conclude that disease modifies the sound. Thus in a patient, whose thyroid cartilage was torn by the bursting of a shell, the sound, on percussion of the larynx, is perfectly dull. Yet when a fistula which exists in the trachea, is closed, he breathes through the glottis with perfect ease, and his voice is unaffected. On the other hand, we may find that such affections as do not diminish the capacity of the larynx, may co-exist with the natural sound on percussion, as we find in the ulceration of the ventricles, so common in phthisis.

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* See a Paper, by Professor Jacob, on the structure of the mammary gland in the Cetacea, with Observations on the mechanism of the mouth and soft palate, as applied by the young animal in sucking. Dublin Med. and Chem. Journal, No. xxiii., 1835.

The subject is one open for investigation, and I shall merely remark, that in the few observations which I have made, the sound did not seem lessened in old persons, nor was it diminished by the existence of a considerable œdema of the neck.

The active signs are those of respiration and voice; and, as in most cases, both are affected, we must study their phenomena carefully. I have already alluded to the division of laryngeal diseases into those with and those without notable mechanical obstruction. Few cases, indeed, occur without some degree of stridor, which is sometimes only perceptible on a forced inspiration; but there is an extensive class in which the patient hardly suffers from laryngeal obstruction, and in which the stridulous breathing is barely perceptible. In these cases death takes place, not from laryngeal, but from pulmonary disease.

On the other hand, great mechanical obstruction, and its consequent distressing stridor, are more allied to laryngeal disease, without pulmonary complication. In such cases the ear at once points out that the obstruction is in the upper part of the windpipe, very different indeed from another case of stridulous breathing, where, as in the pressure of an aneurismal tumour on the trachea, the sound proceeds from its inferior extremity.

The stethoscopic signs are the altered character of the laryngeal sounds of inspiration and expiration, and the existence of a rale in the larynx. With respect to the first, we find that the sound of respiration loses its softness and smoothness, and becomes harsh, conveying the idea of a roughened and rigid state of the laryngeal surface. This is perceptible even when no stridulous breathing exists.

In noticing the existence of a rale in the larynx I must observe, that I have examined the phenomenon in but a limited number of cases. It does not occur in all instances, but when present is extremely characteristic. I have found it most evident immediately above the alæ of the thyroid cartilage, where it resembles the rapid action of a small valve, combined with a deep thrumming sound. It is quite peculiar, it disappears as we descend to the bronchial tubes, and may even exist on one side of the larynx without being perceptible on the other, as if it there corresponded to a circumscribed ulceration.

When the obstruction, however, is considerable the loud prolonged respiration sufficiently points out the disease. Under these circumstances the next most important result of auscultation is the great feebleness of the pulmonary expansion, as compared with the violence of the inspiratory efforts. The importance of this fact, and the difficulties which it throws in the way of physical diagnosis, were first noticed in a Report of the Meath Hospital by Dr. Graves and myself,* in which we pointed out how a laryngeal obstruction rendered the detection of pulmonary disease a matter of great difficulty. These observations, however, apply only to the active auscultatory signs; and it is fortunate, indeed, that the above cause does not interfere with percussion.

In laryngeal disease the vesicular murmur becomes feeble in proportion to the obstruction. In severe cases it can hardly be perceived; and this feebleness, or almost complete absence of vesicular murmur, *is observed over the whole chest.* On the latter point I would particularly dwell, as it forms the ground of a diagnosis, which I first pointed out between laryngeal disease and the pressure of aneurismal, or other tumours on the trachea.†

This diagnosis is founded on the observation of the case,

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* Dub. Hos. Reports, Clinical Report of Cases in the Medical Wards of the Meath Hospital, by R. J. Graves, M.D., and W. Stokes, M.D., vol. v.

[illegible] es on the Diagnosis and Pathology of Aneurisms of the Great [illegible] Med. and Chem. Journal, 1834.

previous to the appearance of stridulous breathing. In aneurisms of the aorta it often, though not always, happens, that the compression is first exercised on one of the bronchi, so that an inequality of respiration is produced, the murmur being feeble in one lung, and of increased intensity in the other. As the disease advances, however, the pressure is exercised on the trachea, and stridulous breathing produced.

Now in this primary inequality of respiration we have a diagnosis between the two affections, for nothing of the kind can occur when the obstruction is in the windpipe from the first. In such a case, as the air enters both lungs with equal difficulty, the vesicular murmur is equally feeble.

It would appear that the intensity of the vesicular sound is directly as the force by which the cell is dilated. M. Beau has endeavoured to prove, that the respiratory murmur of Laennec is not produced by the expansion of cells, but by the air striking against the fauces and pharynx, thus causing vibrations which are communicated downwards through the larynx and trachea. He holds that the mere expansion of the cells produces no sound, and supports this doctrine by adducing the fact, that where the individual breathes so as to inflate the lungs without producing the guttural sound, the vesicular murmur ceases to be heard. He draws an analogy between the guttural sound and its consequent vesicular murmur; and the sound of the voice, and consequent broncophonia, both, according to him, being produced by the vibrations in the tubes of sounds which are transmitted downwards.*

I have carefully repeated the experiments of M. Beau, and feel convinced that his conclusions are erroneous, because I have found that in all cases in which his *respiration silencieux* was performed, I could plainly hear a murmur of expansion in the lung. It is certainly not so loud as natural; but the reason of this is manifestly the fact, that to produce silent respiration we must inflate the chest more gently, and of course with less impulse on the cells or minute tubes. When we come to consider the phenomena of puerile and bronchial respiration in local disease of the lung, we shall find that many circumstances totally disprove this doctrine.

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* Beau, Archives Generales de Medicine, Recherches sur la Cause des Bruits Respiratoires, tome v., Aout, 1834.

I shall here allude to a single fact, which in itself is sufficient to overturn the theory; it is that we can hear a natural respiratory murmur in patients who do not breathe through the mouth or nostrils. Of this we can easily satisfy ourselves by examining a person who has been operated on for laryngeal obstruction, and who breathes through a fistula in the trachea. I have now examined eight of such cases, and found that in all the respiratory murmur could be heard with ease. In one instance indeed, where great obstruction existed previous to the operation, I found that for a considerable time after the opening of the trachea the murmur continued intensely puerile.*

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* I may here subjoin the stethoscopic examination of a case of permanent fistula in the trachea without mechanical obstruction in the larynx.

P. K., aged 30, while engaged in the war under Sir A. Campbell, was struck by the explosion of a canister-shot, which tore the thyroid cartilage, and formed a wound six inches long. There was great hæmorrhage, followed by delirium. The wound was dressed by suture, and healed, with the exception of a fistula immediately below the situation of the cricoid cartilage.

At present the region of the larynx is hollow, no trace of *pomum Adami* being visible. The sound is dull on percussion. Immediately below the cricoid region there is a fistula capable of admitting a goose-quill, round which the skin is puckered. This communicates directly with the trachea, but occasionally small quantities of drink and soft food pass through it. There is no dysphagia. The patient wears a soft pad over it, and is thus saved from all inconvenience.

When the fistula is closed the voice is natural and powerful, nor is there any stridor; but when it is open the voice is scarcely articulate, and is combined with a whistling sound. On closing the mouth and nostrils he can breathe without difficulty through the fistula, yet the effort, after some time, fatigues him.

There are no thoracic symptoms, and when the fistula is closed the vesicular murmur is heard with its natural character. When it is open it obtains in the

EXAMINATION OF THE LUNG IN CASES OF CHRONIC LARYNGEAL DISEASE.—It need hardly be observed, that the first step in forming our prognosis and in determining our treatment of laryngeal disease, will be to ascertain the condition of the lung; and there are few situations more embarrassing than to be called on to declare how far the lung is diseased when a chronic affection of the larynx is present. It is true, that where the mechanical obstruction is but slight, we may use the stethoscope with facility and exactness; but even in cases where the lung is fully and freely inflated it will be occasionally next to impossible to determine (even after several examinations) whether the symptoms proceed from laryngeal disease alone, or from its combination with an affection of the lung. This I know from an extensive experience, nor have I been able to satisfy myself as to its cause. The first element in deciding this important question is the fact of the frequent complication of laryngeal and pulmonary disease. Let it be borne in mind from the outset, that of the cases without, and those with, disease of the lung, the latter are by far the most numerous; and that even where the larynx has been first engaged, that the lung may become secondarily affected, and that where both diseases exist they mutually obscure each other.

If there be one form of disease more than another to which these observations apply, it is that termed phthisis laryngea. I agree with Andral and Louis as to the fact of the almost constant complication of this disease with pulmonary tubercle; and I can avow, that after ten years of hospital and private practice, I never saw a case presenting the symptoms of laryngeal cough, purulent or muco-purulent expectoration, semi-stridulous breathing, hoarseness or aphonia, hectic and ema-

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upper part of the chest a slightly tracheal character. Posteriorly and superiorly the voice resounds strongly; and when the fistula is open its vibrations are preceded by a hissing sound.

ciation, in which the patient did not die with cavities in his lung. In some the laryngeal affection seemed to be primary, but in the great majority, symptoms of pulmonary disease existed previous to its appearance.

It is true that in the abscess and mortification of the cartilages we may have symptoms of laryngeal cough, purulent expectoration, and even hectic; but these cases differ in their symptoms, as well as their pathological anatomy, from the ordinary phthisis laryngea, particularly in the prominence and rapidity of the purely laryngeal symptoms.

The first step in the investigation will be to accurately examine into the history of the case, and in particular to determine whether the laryngeal affection was primary, or supervened on an already existing disease of the lung. We must examine what were the very first symptoms, and whether they were referrible to the larynx or lung: we must inquire into the past and present state of the fauces, and also whether a syphilitic taint exists. Now should it be found that the first symptoms were those of a laryngeal character, that the voice had been altered from the outset of the disease, or that a syphilitic taint did really exist, we have a good probability, not that the lungs at the time of examination are free, but that the first morbid action was exercised on the larynx. But if, on the other hand, we find that previous to the occurrence of any hoarseness or stridor, or dysphagia, there has been cough without the laryngeal character, particularly if it was at first dry, and afterwards followed by expectoration; if hectic has existed, although the expectoration continued mucous; if there have been hæmoptysis, pain in the chest or shoulders; and lastly, if the patient has emaciated previous to the setting in of the laryngeal symptoms, we may be almost certain that tubercle exists, and that the case, so commonly called laryngeal, is in reality pulmonary phthisis. And if it appears that the patient is of a strumous habit, or has already lost brothers or sisters by tubercle, we may form our diagnosis with a melancholy certainty, even though at the time we can detect no certain physical sign of pulmonary tubercle.*

But in many cases a physical examination of the chest decides the question. I shall first speak of the active auscultatory signs.

I have already stated, that with respect to the ease of diagnosis, we may divide laryngeal diseases into two classes, namely, those with and those without severe stridulous breathing. In the first of these all the phenomena of respiration are obscured, less from the loudness of the stridulous sound than from the feebleness with which the air penetrates the lung: so great is this in some cases that we can hear almost nothing of the vesicular murmur, and so cannot judge of its different local intensities, and we lose all the sounds of mucus in the tubes, and the signs of anfractuosities, or larger excavations. The voice too being injured, we cannot avail ourselves of the vocal phenomena with satisfaction, and we lay aside the stethoscope in despair.

But it is fortunate that in the obstruction of the larynx there is nothing to interfere with the use of percussion. In this observation we are first accurately to compare the sound given by one clavicle with the other, and in the same way the antero-superior regions, the spines of the scapulæ, the axillæ, and the interscapular regions. This comparison of corresponding opposite portions having been made, we next compare the upper with the lower parts of the chest, and the observation is complete. Now if, coexistent with the symptoms of laryngeal cough, muco-purulent expectoration, semi-stridulous breathing, and hectic, we find a notable difference between the sounds of opposite corresponding portions, we need scarcely go farther for evidence of tuberculization of the lung. It may be stated generally, that there are but two diseases which produce the combination of the physical signs of dulness of a clavicle, with the symptoms of stridulous breathing and laryngeal cough; these are aneurism of the aorta or innominata, and the disease under consideration, and it will rarely happen that these can be confounded. Under any circumstances the localized dulness points out that there is something more than laryngeal disease, and we know from experience, that that something more is in the great majority of cases the tuberculization of the lung.

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* It may be observed here that purulent expectoration, in any quantity, is seldom seen from simple disease of the mucous membrane of the larynx. From its small dimensions and constituent tissues, its secretions, both in health and disease, are scanty; and it may be stated, that in cases of laryngeal disease, with copious puriform discharges, there is either an abscess in the neighbourhood, and communicating with the larynx, or what is much more frequently the case, suppurating tuberculous cavities in the lung.

I may here remark, that this is one of the cases in which the mode of investigation by successive observations, is often extremely applicable; and thus, although at our first examination no direct evidence of pulmonary disease can be obtained, yet on the second or third time of its performance the change may become manifest. Under these circumstances the gradual loss of sonoriety of either clavicle or scapular ridge will at once declare the nature of the disease.

There is one case which closely resembles this disease, namely, the hectic of syphilis, with a secondary affection of the larynx. Here nothing but an accurate investigation of the history and period of duration of symptoms will suffice to clear up the diagnosis. With respect to particular symptoms, I have only to remark, that in this case I have never seen purulent expectoration, nor is there any evidence of solidification of the upper portions of the lung. On the other hand, we must never forget that many of such cases end by pulmonary tubercle.

Treatment of Chronic Laryngitis.—In all forms of the disease, in which there are grounds for hope of recovery, the physician must insist on the patient using his voice as little as possible. To insist on absolute silence is hardly useful, but all prolonged or constant exertions of the voice must be forbidden; and if the patient's profession require such exertions, he must give up its practice for a considerable period of time.* He should remain within doors except during the finest weather, and guard against all exposure to fresh cold.

The medical treatment best calculated to relieve, may be stated to be the repeated application of leeches, in small numbers, to the trachea and larynx, with continued counter-irritation, by means of small blisters, and the tartar emetic ointment. In some cases the seton has had a good effect.

Of internal remedies the most powerful is undoubtedly mercury, more especially in the syphilitic cases, and particularly if it has not been used before, or only sparingly employed. But the most careful examination must be made previous to having recourse to this means; for if a tubercular disposition exist, there is nothing so likely to call it into action as the effect of mercury. I do not know any case in which such caution is necessary in its exhibition as this. It is, however, a remedy of great value, and may be used as well in the idiopathic cases as in the secondary syphilitic affections.

As to its mode of exhibition, we may employ it either by inhalation, or administer calomel and opium internally. In some cases I have seen the mildest preparations of mercury act well.

The state of the pharynx is to be carefully attended to; for in many cases, particularly of the syphilitic or scrofulous character, it may exhibit various lesions, such as superficial or deep-seated ulcerations, affecting the velum, back of the pharynx or tonsils; relaxations of the uvula; œdematous and vascular conditions of the parts, &c. To the importance of applying direct remedies in these cases the attention of medical men has been strongly directed by Dr. Graves. We may employ, according to circumstances, either a solution of nitrate of silver, containing from ten to fifteen grains to the ounce; the caustic solution of iodine, as recommended by Lugol, or the inhalation of the vapour of iodine, combined with a narcotic.*

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* Although accurate returns are still wanting, it would appear that in individuals of the two professions, in which public speaking is most required, namely, lawyers and clergymen, the latter are most liable to laryngitis. The explanation of this seems to be, that the clergyman begins to exercise his vocal organs at a much earlier period than the lawyer. The young clergyman, often of a feeble and nervous constitution, and acting under conscientious motives, to the neglect of bodily health, not only reads the service, and preaches once or twice, or even more often in the week, but is exposed to night air and the inclemency of weather. He is compelled to do so, while both the larynx and constitution of the lawyer have, in general, full time for maturity before he need employ the one or expend the other in the duties of his profession.

After these remedies have been carried into effect, we may advantageously exhibit the sarsaparilla decoction with nitric acid; or, in some cases, the Fowler's solution. Counter-irritation should be still kept up, and continued for a length of time after the subsidence of the laryngeal symptoms.

In some cases spasmodic exacerbations occur, so severe as to threaten the life of the patient. These are more frequently met with in females, and demand a careful study. The suddenness and violence of the attack, the absence of corresponding fever, and of tumefaction of the epiglottis, will, in general, suffice for diagnosis. I have often seen cases in which the suffering was so severe, as that the instant performance of tracheotomy was advised, yet in which the breathing was restored to its ordinary condition by the following simple treatment: the feet were plunged in warm water, the body enveloped in blankets, and a draught, consisting of camphor mixture, ammonia, valerian, ether, and opium exhibited, and repeated according to circumstances. Under this treatment symptoms will rapidly subside, which, from their character and continuance, would seem to demand the knife; and I would advise, that in all cases, previous to the performance of tracheotomy in chronic laryngitis, the question be carefully investigated, as to whether the urgent symptoms are the result of spasm or organic obstruction. Let it never be forgotten, that even where organic disease and thickening of the larynx exist, spasm may supervene, and be met by appropriate treatment. We are too much attached to the doctrine of diseases being necessarily separate, but experience tells us that nothing is more common than to see spasm following organic disease, or organic disease occurring after a purely nervous lesion.

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* The best mode of applying these caustic lotions is that practised by Mr. Cusack: a brush of lint, of the requisite size, is sewed on the end of the finger of a glove, which is then drawn on the index finger of the right hand. The patient should be made to gargle with warm water, and the lint being dipped in the solution, can be at once, and with great facility, carried to any part of the pharynx, and even to the rima.

In cases showing this liability to spasm, the belladonna, or other anodyne plasters, may be usefully employed.*

I cannot leave this part of the subject without alluding to the effect produced by relaxation and elongation of the uvula in producing symptoms of laryngeal irritation. This fact has been long known, and I shall here merely enumerate the various forms of symptoms which I have known to be relieved by the simple operation of removing the lower, or non-muscular portion of this process.

1st Case. Cough, coming on at night on the patient's lying down. It is incessant, and accompanied by wheezing, dyspnœa, and restlessness. Nearly complete absence of symptoms during the day.

2nd. Cough of a laryngeal character, with a feeling of stuffing and tickling of the throat; alteration of voice, and hawking up of mucus.

3rd. Symptoms very analogous to humid asthma, with a loud sonorous rale over the chest.

4th. Symptoms of the dry catarrh in old persons, without laryngeal cough, stridor, or alteration of voice.

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* Dublin Hospital Reports, vol. v. Report of the Meath Hospital, by R. J. Graves, M. D., and W. Stokes, M. D.

5th. Symptoms of chronic laryngitis, hoarseness, some stridor, loud cough.

6th. The preceding symptoms, combined with hectic and purulent expectoration, so as to resemble true phthisis laryngea.

7th. All the usual constitutional symptoms of phthisis, such as cough, puriform and bloody expectoration, hectic, emaciation, quick pulse, yet without the physical signs of pulmonary tubercle.

Such a variety of effects only exemplifies the variety of constitutions; and without doubt a more extended experience will discover other modifications of symptoms. In all these, the ordinary treatment either altogether failed, or was but partially successful, and this result may often lead to the suspicion of the disease. But, in truth, the physician who neglects the examination of the fauces in any case of pulmonary disease is neither doing justice to his patient nor himself.

As might be expected, the removal of the exciting cause does not always produce the beneficial effect immediately. In almost all chronic functional lesions more or less of organic change occurs; and in the case before us it may happen, that even incurable mischief may be thus produced. Still in the great majority the relief is most remarkable, and simple palliative treatment will suffice to restore the patient's health.

SPECIFIC IRRITATIONS OF THE LARYNX.

In the present state of our knowledge we can do little more than announce the existence of these forms of disease; for their history and diagnosis are still to be established, and their pathological anatomy to be investigated. Suffice it to observe, that the various morbid constitutional states may produce their secondary local effects on the tissues of the larynx, and thus cause symptoms, the treatment of which requires an investigation into the exciting cause and diathesis. Gout, syphilis, scrofula, and scorbutus may attack the larynx; and so also in typhus fever, in erysipelas, and the other exanthemata, there may be laryngeal diseases whose characters are peculiar. But though promising so rich a harvest this field is still unexplored.

SPASMODIC AFFECTIONS OF THE LARYNX.

Endowed with a curious and complicated muscular apparatus, and with an exquisite sensibility, the larynx is liable to various forms of neurosis; of these the active have only, as yet, been investigated, while of the existence of the passive forms scarcely any notice has been taken.* Under the first head we may class the spasmodic croup of children, the spasm of the glottis in hooping-cough, and the various forms of hysterical, nervous, and sympathetic cough; while of the second we can only say, that paralysis of the muscles of phonation is seen in certain cases of cerebral disease; and that reasoning from analogy, we may further admit the existence of another form of paralysis, similar to that of the intestines in ileus, and of the intercostal muscles in pleurisy, and resulting from the same cause, namely, the inflammation of a tissue in connexion with the muscular fibre.

SPASM OF THE GLOTTIS OF CHILDREN.—This disease consisting essentially in a spasm, or active neurosis of the glottis, seems to result in all cases from cerebral irritation, *which may be either primary or secondary to some other disease.* Its existence has been recognized since the middle of the last century, and a host of authors have described or alluded to its symptoms, but of these the latest is Dr. Marsh, of whose researches* I shall avail myself.

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* I here adopt the classification of neuroses into active and passive, as given by Broussais—Comment. sur les Propositions de Pathologie. By active neuroses are meant those with increased innervation, such as spasm, convulsions; while the passive imply a minus degree of innervation, or paralysis.

This disease may shew itself as a simple spasmodic affection of the larynx, independent of any other perceptible lesion; but this is the rarest case. In others it is connected with the irritation of dentition, or of deranged digestive function; while in a third class, it is symptomatic of primary cerebral disease. Many circumstances concur to distinguish this disease from the laryngitis of children. In the first, or mildest variety, there are paroxysms of stridor; but in the interval, the little patient may be free from all distress, and without any fever, or signs of mucous irritation. In the second, although the general health may be much deranged, yet the symptoms are not these of an irritation of the respiratory system. The child may have remittent fever, or a deranged state of the bowels or liver, with nervous irritation; but the laryngeal symptoms occur in paroxysms, between which the breathing remains free. In such a case the child may labour under the symptoms for months, and the disease either subside, or become complicated with more decided signs of irritation of the brain, such as convulsions, strabismus, and coma. Indeed, in this form a symptom is commonly observed, first described accurately by Dr. Kellie,† namely, the spasmodic flexure of the thumb across the palm of the hand, and also an analogous state of the toes. This, it is unnecessary to observe, points out an excited state of the nervous centres. Lastly, in the third form, there are generally decided evidences of cerebro-spinal irritation, such as frequent fits of convulsions, and the usual train of symptoms of meningeal or encephalic irritation. Here the spasm of the glottis is as symptomatic of the cerebral disease, as are the convulsions of the extremities.

Repeated fits of a crowing respiration, not followed by cough, as Cheyne has remarked, and occurring either without constitutional symptoms, or co-existing with dentition, digestive or cerebral irritation, form the characteristic features of this disease, which is easily distinguished from the true croup. If to these we add the absence of laryngeal obstruction between the fits, and also that of the physical signs of bronchitis we can have no difficulty in forming our diagnosis.

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* Dublin Hospital Reports, vol. v. On a peculiar disease of children, which may be termed spasm of the glottis, by H. Marsh, M.D.

† *Edin.* Med. and Surg. Journal, October, 1816.

NERVOUS AFFECTIONS OF THE LARYNX IN THE ADULT.

We meet with spasm of the glottis in the adult, either with or without organic disease of the larynx, though in most cases it supervenes on chronic laryngeal affections. In females, however, we find it as one of the symptoms of the protean hysteria, when it may be a transient or long-continued affection. Here, as in the disease already described, the spasm is commonly during inspiration.

I have not materials to enable me to enter into an account of the various hysterical and nervous affections of the larynx in females, but shall merely enumerate those which I have often observed, most of which have been long known.

1st. Simple aphonia, supervening on mental excitement. Its duration is exceedingly various, and its disappearance often as sudden as its invasion.

2nd. Fits of croupy breathing.

3rd. Long-continued stridulous breathing, without fever.

4th. A hard, loud, solitary cough, without any stridor. In its more violent forms this has got the name of tussis ferina.

5th. A similar cough, followed by an inspiration not stridulous, but with the *exspiration* long, sonorous, and groaning, so as to resemble the howling of a dog.

6th. A short but teasing cough, occurring in the most rapid succession; and during the paroxysm causing the greatest distress and exhaustion.

7th. The most violent form of the tussis ferina, with greatly increased action of the heart and arteries, hurried breathing, loud puerile respiration, and profuse sweatings. In such a case I have seen the disease continue to for more than a year, yet there was no emaciation.

Other forms may also occur, but the above are those which have fallen under my own observation. With respect to diagnosis the points of importance are, the co-existence of other hysterial phenomena, or their having preceded the symptoms, the absence of fever, the character of the cough, *the want of the regular succession of phenomena, as observed in laryngitis,* the frequent absence of hoarseness, and lastly, the resistance of the symptoms to ordinary antiphlogistic treatment.

A spasm of the glottis, however, may occur independent of any hysterical tendency. Thus, in a lady whose case was mentioned to me by Mr. Goodall, there have been attacks of this kind for many years, some of which have been so alarming as to excite fears for life. The patient is now sixty years of age, and exhibits no signs of hysteria. We are not in possession of facts to prove that spasm of the glottis ever occurs in the adult male, without the previous existence of organic disease.

We are indebted to Mr. Kirby for a case in which death was apparently produced by spasm of the glottis, in consequence of obstruction of the œsophagus by pieces of meat and bone.[*] The largest morsel lay immediately behind the cricoid cartilage; but its pressure, nor that of another portion, which was low down in the œsophagus, had not diminished the calibre of the windpipe. The epiglottis almost completely concealed the cavity of the glottis, which was so diminished by the forward inclination of the arytenoid cartilages as to be scarcely discernible, and the rima was altogether closed.

Although it is doubted whether the symptoms of suffocation, in the case of a foreign body lodging in the œsophagus, are

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[*] Dublin Hospital Reports, vol. ii. A case in which suffocation was produced by a portion of solid food in the œsophagus, by J. Kirby, A. B., &c. 1818.

are produced by a spasm of the glottis,* yet I incline to the possibility of such an event, not merely from the case just alluded to, but from my having seen an instance in which a piece of money was lodged in the œsophagus, and where croupy breathing, and other laryngeal symptoms, were manifestly the result. In this instance the foreign body was not lodged in the fauces or pharynx.

But in the adult the spasmodic affections of the larynx are met with most commonly in connexion with organic disease either of the windpipe or lung, or of both combined. In by far the greater number the organic lesion has been antecedent, and the nervous affection is shewn by spasmodic exacerbations of the laryngeal breathing, which are full of danger. To these I have already alluded, and shall merely add, that in a few cases the reverse may occur, and a disease, at first functional, pass into organic change; nor should the long continuance of symptoms of a decidedly nervous or hysteric character put the practitioner off his guard; of this the following case is a striking illustration.

A young female entered the Meath Hospital labouring under fever, from which, after a relapse, she recovered, but it was to become affected with a new and singular train of nervous symptoms. She had hysteria, in almost all its forms. Epileptic convulsions, violent spasms, coma, screaming, tympanitis, paralysis of the bladder, intractable vomiting, succeeded one another in a miserable succession; yet after many months of suffering her flesh and appearance were singularly preserved: she lastly was attacked with a cough having every resemblance to the hysteric form, and relieved by antispasmodic medicines. This subsided on the appearance of an eruption of varicella, followed by a typhoid state, with, for the first time, emaciation. This subsided, but the cough returned, and continued for nearly three weeks, when she sunk, with symptoms of suffocation. On dissection, an abscess, of the size of a Spanish nut, was found involving the cricoid; and though all the cavities were minutely examined no other disease could be discovered. Had this been recognized, tracheotomy might have prolonged her miserable life.

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* Surgical Pathology of the Larynx and Trachea, p. 224.

In this case death took place by organic change of the larynx itself. But in severe or long continued spasmodic affections of the windpipe, the brain is also in danger of organic lesion. It is a curious fact, that in three of the most extraordinary cases of hysteric or nervous cough which I have witnessed, there was evidence of such an occurrence. In one, of long-continued cough and spasm during expiration, the patient, a young female, after having recovered of this, died with latent meningitis. In the second case, the symptoms were frightful paroxysms of a tearing, incessant cough, followed by fever, headach, strabismus, and the other symptoms of hydrocephalus. This patient recovered under antiphlogistic treatment, and the use of mercury. In the third, there were long-continued paroxysms of the most severe stridulous breathing, tussis ferina, and convulsions. This patient, after years of suffering, recovered, but died suddenly. All these patients were young females, of lymphatic temperaments. From these cases, and others which might be quoted, we derive the practical rule, that even after puberty, the spasmodic affections of the larynx may be indicative of cerebral disease.

I have often found, even in cases where manifest organic disease both of the larynx and lung existed, that the cough was best relieved by antispasmodic medicines; and in chronic phthisis our best cough mixture will often be a combination of powerful antispasmodics. And I have more than once observed, that where tuberculous phthisis supervened on hooping-cough, the cough preserved its character even after extensive cavities were formed in the lung, and until the fatal termination of the disease. From these facts, and others which might be quoted, we derive the rule that the existence of organic disease should not make us neglect the use of antispasmodics; nor the fact of long-continued and apparently functional affections of the larynx, even occurring after puberty, make us overlook the possible supervention of organic change in the larynx, or even in the brain itself.

FOREIGN BODIES IN THE LARYNX, TRACHEA, OR BRONCHIAL TUBES.

As yet we have no monograph on this subject; and the student must wade through a mass of periodicals to arrive at the knowledge he seeks, and after all, he will find no general principle of diagnosis laid down, but merely a number of cases, certainly of great interest, but still not calculated to satisfy his mind. The memoirs of Pelletan* and Louis,† and the work of Mr. Porter,‡ in which the subject is introduced, will be the principal sources of his information. Almost all the rest will consist of isolated examples, published by practitioners who have met with an accidental case, and have not devoted themselves to any original investigation of the symptoms and treatment of this affection.

Before entering on the different symptoms, I shall allude to a few particulars as connected with the entrance of the foreign body into the air passages, and its nature.

It would appear that bodies of a size so large as to exceed the ordinary diameter of the glottis, have yet passed through that aperture, and lodged in the larynx, trachea, or bronchial tubes. This fact was first satisfactorily explained by Dr. Houston, in his remarks on a case of this description.§ After observing on the rarity of the case, and its interest, as shewing that a body apparently much larger than the aperture of the rima glottidis, and one even of different form, could find a passage through that fissure, Dr. Houston says: "To understand aright how a body of greater apparent dimensions than the rima glottidis, could have found a passage through that aperture, it is only necessary to reflect for a moment on the nature of the process of inspiration. The introduction of air to the lungs with every breath, is consequent upon the enlargement of the chest; the weight of the atmosphere pressing the adjacent column into the cavity, with a rapidity proportioned to the suddenness and extent of the dilatation, and with a force sufficient to carry along in the current any light moveable body which may happen to come in the way. A small body, so intercepted, will readily pass with the air through the rima, and be lodged in a part of the tube lower down. A body of inordinate dimensions may stick so firmly in the aperture, that the full weight of the atmosphere is unequal to its propulsion onwards, and death from suffocation will be the inevitable consequence, if the foreign body be not instantly shot back again by a powerful expiratory effort, or removed by operation. And a body of intermediate size, viz. one of such moderate dimensions as to be capable of passing through the rima by stretching and divaricating the sides of that aperture, may, when pressed heavily by the atmosphere, as it would during a forced inspiration, be driven past the obstruction, and thence into the trachea or bronchial tubes. Such latter wa sno doubt the mode by which the tooth, in the case above related, found a passage into the bronchus. The man holding his breath during all the time of the operation, suddenly at the moment in which the extraction was completed, took a full inspiration; upon which the tooth, partly by its gravity, (the head being at the time thrown back,) and partly carried by the air rushing to the windpipe, fell over the aperture leading into that tube. The obstruction caused thereby to the further entrance of air, induced a spasmodic increase of action in the muscles of inspiration, and a consequent increase of pressure by the air at the opening, by which the tooth was driven with force through the fissure."

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* Clinique Chirurgicale, tom. i. Mem. 1.

† Memoire sur la Bronchotomie. Memoires de l'Acad. Royale de Chirurgie, tom. xii.

‡ Surgical Pathology of the Larynx and Trachea.

§ Dublin Journal of Medical and Chemical Science, No. XXIII. account of a case in which a large molar tooth passed into the larynx, during the operation of extraction, by John Houston, M. D. &c.

The foregoing considerations may explain why it is tha a foreign body that has entered the larynx during inspiration, is so seldom expelled by expiration, notwithstanding the most violent efforts of coughing; but that it will remain in the air-passages, and unless removed by operation, bring on a train of formidable and generally fatal symptoms. It is obvious, that in the case of a body which has only passed the glottis by stretching and divaricating that aperture, the forces accessary to its introduction must be infinitely greater than those which could be brought to bear on its expulsion; for in the first case it is acted on by the pressure of the atmosphere, while the powerful respiratory muscles are in the highest state of exertion, while in the latter, there is nothing to expel it but the comparatively feeble efforts of expiration. The dilated state of the glottis during a forced inspiration, is also a condition favouring the entrance, though not availing for the expulsion of the body.

With respect to the nature of the orifice itself, it is to be observed, that the common idea of its being a pyramidal opening, whose summit varied in its orifice according to the degree of dilatation or contraction in which it was examined, is now disproved, and the researches of Liscovius and Malgaigne have been recently verified and extended by Professor Lauth of Strasburgh.

According to this author, the length of the glottis increases with the volume of the larynx, according as we examine it in the infant, the adult female, or the male. In the adult, according to the sex, the extent from before backwards varies from seven to thirteen lines, the dimensions being taken at the period of repose: he has never found it so long as fifteen lines, as described by Malgaigne. But the length of the opening is not always greater in man than in woman, for it has been found, even in tall men, but from seven to eight lines, while in women it has been met with from eight to nine lines in length.

It is further shewn that the lips of the opening are not straight, but nearly at the centre project towards the mesian line, in consequence of the prominence of the anterior apophysis of the arytenoid cartilage. The base of the glottis is also terminated by a line, curving inwards, so that in the state of rest the form of the glottis may be compared to that of the steel of a halbert.

In consequence of this disposition, the opening may be considered as formed of three parts, the anterior, middle, and posterior, and in a glottis of eleven lines in length, the anterior, with its portion of middle, measures seven, and the posterior, with its portion of middle, four lines. The width in the middle portion is two lines and a half.

But by the contraction of its muscles, its dimensions are altered: it may be elongated or widened. Lauth has found, that in a glottis of eleven lines in length, the opening may become twelve lines, while its width is diminished to two. In its transverse enlargement, however, it becomes of a lozenge shape, and while the arytenoid cartilages can be separated to so much as five lines and three-fourths, the length of the opening shall remain the same. It is plain that this condition will be the most favourable for the entrance of a foreign body, inasmuch as now the opening exhibits its greatest possible enlargement, and this change is produced by an inspiratory muscle—the posterior crico-arytenoid, which, as Lauth remarks, repeats on the larynx the action of the intercostals on the ribs.

The situations in which the foreign body may remain can be enumerated as follows: it may be impacted in the rima itself, or pass and become entangled in the ventricles of the larynx; it may pass into the trachea, and from thence into the bronchial tubes, particularly the right, and from these situations, by the efforts of coughing, be forced upwards into the larynx, again to return to its former position.

When the body is met with in the bronchial tubes, it has been observed in the great majority of instances, to be contained in the right bronchus, and this circumstance, so interesting in a general point of view, I shall shew to be of the utmost importance with respect to diagnosis. It has been supposed that the cause of this phenomenon is to be found in the greater size of the right bronchial tube, but this explanation appears insufficient. It might explain the lodgment of a foreign body in the right bronchial tube, that was too large to enter the left, but would throw no light on the fact, that bodies small enough to enter the left, are yet most commonly found in the right tube.

I apprehend that the true explanation of this interesting fact will be found in the anatomical disposition of the trachea at its bifurcation, where we may observe that the projection or septum dividing the right and left bronchi, is not in the mesian line, but decidedly to the left of it. So that a body passing through the glottis, will be thus directed into the right bronchus.* Another explanation has been founded on the different directions of the two tubes, the right being more vertical than the left, but the difference is scarcely sufficient to explain the phenomenon. It might be farther supposed, that as the right lung has a greater capacity than the left, the force of the air entering through the bronchus would be proportionally augmented; but this opinion loses much of its weight, when we reflect on the different diameters of the tubes.

When the foreign body has passed into the air passages, various results may be observed. It may be violently expelled through the glottis, after a period of time varying from a few moments to many years. It may produce death by suffocation, in consequence of its becoming impacted in the larynx; it may cause acute inflammation of the whole lung, and the patient die before abscess has formed; it may form an abscess in the lung; or lastly, produce death with the symptoms of chronic consumption.

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* For this observation I am indebted to my friend, Mr. Goodall.

We are not in possession of facts competent for the explanation of these different results; but they seem to shew, that even if we admit with Desault, that the trachea and bronchial tubes possess a much less degree of animal sensibility than the glottis,* yet that their organic sensibility is decided, inasmuch as we find disease to result from the presence of foreign bodies extremely various in their characters. And it would also appear, that this organic sensibility of the air passages varies remarkably in different individuals, as in some an acute, and in others an extremely chronic disease is induced by bodies of a similar nature, and it is further observed, that in some individuals there is fixed pain, while in others the most enormous disease may occur without any local pain whatever.

In certain cases the expulsion of the foreign body, even after the long continuance of consumptive symptoms, has been followed by recovery, but in many this favourable result does not occur, and the patients sink from the chronic disease induced by the accident.

It has been conceived that the physical characters of the foreign body influence the violence of the symptoms; a sharp and rugged substance, it is supposed, will cause greater distress than one with a smooth surface, and it is true, that in many of the most remarkable cases of pain and distress, occurring from the first, the foreign body has been of the former description; but on the other hand, bodies of irregular forms have remained in the air passages without the production of pain.

In considering this subject, we must separate the mere occurrence of pain from that of the other distressing symptoms. Facts are wanting to throw light on the occurrence of pain, but I have little doubt, that the great cause of distress will be found to reside in the degree of mechanical obstruction produced by the foreign body. This we should *a priori* expect, but in confirmation of the opinion I may observe, that in all the cases which I have seen, the distress was directly as the feebleness of murmur in the affected lung.

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* Œuvres Chirurgicales: tom. ii.

Thus if a smooth body, such as a bean, enters the bronchus, and from the efforts of inspiration so obstructs the tube, as totally to preclude the entrance of air, the distress is enormous, the patient being suddenly deprived of the use of half of his lungs; while on the other hand, an irregular body, such as a tooth, may exist long in the same situation, with comparatively little distress, because, though to a certain degree obstructed, the tube is not impermeable. I have had repeated opportunities of confirming this opinion, and it appears that the smoother the body, the greater the liability of complete occlusion of the tube. In one of the most remarkable instances which I witnessed, the foreign body was a peeled kidney-bean, and the extinction of the respiratory murmur was complete and permanent. In two cases, however, in which plum-stones had entered, I observed complete extinction of respiration, and it is probable, that a spasmodic closing of the tube around the body had then taken place. We may also understand, that an irregularly formed body, which can neither directly plug up the tube, nor be completely grasped by its spasmodic contraction, will be less likely to be driven into the trachea by the effort of expiration, much of the effect of which will be expended from the pervious state of the tube. Here we have a cause of the production of *chronic symptoms*, by extraneous substances of an irregular form.

It is an interesting fact in corroboration of this opinion, that in the great majority of cases, in which chronic consumptive symptoms were produced, the foreign body was of an irregular form. The patients escaped rapid death, because the air passage was not completely obstructed, and their symptoms resulted from the long-continued irritation of the foreign body.

In considering the diagnosis of this accident, I shall not enter into an analysis of the numerous cases on record, in which foreign bodies have entered the windpipe. For however interesting these may be, the observation of the symptoms is not sufficiently accurate, nor has there been, until our own time, any attempt to combine the evidence of symptoms with that of physical signs. I shall therefore content myself with giving a sketch of such symptoms as have been observed previous to the discovery of auscultation, and then examine the state of our knowledge as to the physical indications.

DIAGNOSIS OF FOREIGN BODIES IN THE WINDPIPE.—It has been long observed, that when the foreign body remained impacted in the larynx, the symptoms from the first were more violent and distressing. Incessant cough of a spasmodic character, croupy breathing, pain in the region of the larynx, paroxysms of suffocation, are the ordinary symptoms. The termination of the case may be by sudden death, in consequence of the obstruction of the rima; or the foreign body may be expelled, or fall into the trachea, and an interval of comparative ease be induced, succeeded either by a return of the laryngeal symptoms, or by an acute or chronic irritation of the lung itself.

The violence of these symptoms, however, does not altogether depend on the fact of the foreign body being lodged in the larynx; much depends on the degree of mechanical obstruction, and the nature of the offending body. La Martiniere has detailed a case in which a piece of gold remained in one of the ventricles of the larynx for years without these distressing symptoms.* Nevertheless, as a general rule, the lodgment of the body in the larynx produces the greatest suffering.

In this respect we may divide the cases into two classes, those in which the foreign body has remained, from the first, impacted in the larynx; and those in which, after having passed this portion of the tube, it is driven upwards from the trachea to be temporarily entangled in the larynx, again to descend into the trachea or bronchial tubes, producing those remarkable alternations of suffering and comparative ease, so commonly observed in cases of this accident.

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* Memoires de l'Academie Royale de Chirurgie.

But when the body has descended into the trachea, two orders of symptoms are induced, and we may observe violent and acute suffering, or symptoms of a much more chronic character.

In the first case, the symptoms are in general more or less remittent, at least in the earlier period, and we observe violent paroxysms of cough and suffocation, alternating with a state of calm, often so complete, as for a time to banish all apprehension from the minds of ordinary observers; thus after a paroxysm so violent as to threaten the life of a child, we may see him return with eagerness to his play, without the existence of any external symptom or sign, which could reveal the dreadful accident that has befallen him. The paroxysms however become more frequent and severe, and inflammation of the mucous membrane begins to appear. At length the irritation becomes permanent, and if relief be not speedily afforded, the patient sinks under the aggravated sufferings of obstructed respiration.

In these cases the symptoms of fever are consecutive to those of the local irritation, and the paroxysms of suffering are induced either by the body being driven upwards into the larynx, or by its being impacted in the bronchus, so as suddenly and completely to obstruct the tube, and in a moment, as it were, deprive the patient of one lung. From the secretion of the mucous membrane, a rattling takes place in the throat, and as the disease advances the respiration becomes stridulous. According to Mr. Porter, however, the sound is never so loud nor harsh as in acute cynanche trachealis. Louis has described the occurrence of emphysema above the clavicles, but this is one of the rarest symptoms. Lescure,* however, has mentioned a case in which the lungs were found emphysematous throughout their whole extent.

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* Memoires de l'Academie de Chirurgie. Tome v.

As might be expected, the cerebral circulation suffers in consequence of the violent cough. Thus convulsions are commonly observed, and even apoplexy, particularly if the patient be advanced in years.

In other cases the brain may be so injured, as that death shall take place with cerebral symptoms, even after the removal of the foreign body.

In the second class of cases, or those in which the foreign body remains in the windpipe or bronchus, the greatest variety of symptoms may be produced. And of the recorded cases the following are the most remarkable:

1. Chronic inflammation of the larynx and trachea.
2. Chronic phthisis.
3. Pulmonary abscess.
4. Bronchitis, with or without hæmoptysis.
5. Acute pleuro-pneumonia.
6. Acute phthisis.
7. Asthmatic symptoms.

The subjoined table, into which I have thrown the most remarkable cases on record, will establish the above positions.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
HOUSTON.[*]	Sudden laryngeal irritation after the removal of the second molar tooth; disappearance of the tooth; tendency to sigh; occasional cough; no hoarseness or stridor; respiration in right lung feeble, with a little bronchitic rale.	The root & fangs of the tooth.	Death in eleven days by bronchitis and pleuro-pneumony, commencing in the right lung and invading also the left. The tooth was found in the right bronchus. The right lung was hepatized.

[*] Dublin Journal of Medical and Chemical Science, vol. v. 1834.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
BONETUS.*	Cough and sense of suffocation.	A cherry-stone.	Expulsion after three weeks. Recovery.
ARNOT.†	Symptoms of phthisis.	A piece of bone.	Expectoration of the bone two months after it had entered the windpipe. Recovery.
GILROY.‡	Sudden laryngeal irritation while at dinner; violent cough, with threatened suffocation. These soon subsided, but slight cough and soreness at the top of the sternum remained. After five weeks, fever, with violent cough when on assuming the erect position; hectic; purulent expectoration; fœtor of the breath.	A portion of chicken-bone weighing six grains.	Death in about three months from the entrance of the bone, which was found in the right bronchus. The bronchial tube communicated with a large abscess, containing about twenty ounces of pus, and occupying the right lung.
LOUIS.§	Cough. Fever. Hæmoptysis.	A portion of veal bone.	After four months, expectoration, with recovery.
LENGLET.‖	Severe cough, suddenly supervening; hæmoptysis, and consequent fœtid and purulent expectoration; pain in the left side.	A sharp piece of bone.	The bone was expectorated after many months, but the patient died with abscess of the left lung.
PELLETAN.¶	Violent cough with pneumonic symptoms; failure of bleeding emetics and blisters to relieve it. The foreign body could be felt externally.	A piece of flint.	The operation was performed after twenty-two days, and the foreign body driven out by expiration. The cough continued; purulent expectoration supervened. Death, with phthisical symptoms in eight months from the accident.

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[*] Med. Septem. Collect. lib. ii. sect. 9. De Affect. Asp. Art. cap. viii.

[†] Edinburgh Med. Essays, vol. ii.

[‡] Edinburgh Med. and Surg. Journal, vol. xxxv. 1831.

[§] Mem. de l'Academie de Chirurgie.

[‖] Mem. de l'Academie de Chirurgie, tom. v.

[¶] Clinique Chirurgicale, tom. i.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
DESAULT.[*]	Sudden and violent cough, with dyspnœa and pain, coming on while the person was eating cherries. Passage of these symptoms into those of laryngeal phthisis.	A cherry-stone.	Death in two years. The foreign body was not expectorated.
[†]	Violent cough subsiding in a few hours. In a year, return of the cough, with fever.	A cherry-stone.	Expectoration of a mass of calcareous matter, with the cherry-stone in the centre. Copious purulent expectoration, and death soon afterwards.
CRAIGIE.[‡]	Violent laryngeal irritation passing into the chronic state.	An artificial tooth.	After two years, expectoration of the foreign body; partial recovery; hæmoptysis, and death, with symptoms of phthisis.
DONALDSON.[§]	Sudden & violent coughing, followed after some days by vomiting & fœtid expectoration, without fever. After some time the pulse rose. Sensation as of a rough substance passing up and down the sternum.	A head of grass, (*cynosurus cristatus.*)	Expectoration of the foreign body in about seven weeks. Rapid recovery.
HOCHSTETER.[‖]	Hoarseness and emaciation, supervening on the entrance of a coin during sleep.	A Portugal ducat.	Expectoration after two years and a half. Recovery.
BARTHOLIN.[¶]	The patient laughed while swallowing a nut. Sudden violent cough, followed by fever and emaciation.	A nut.	Expectoration after two months. Recovery.

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[*] Œuvres Chirurgicales, tom. ii.

[†] Ephemerides. Curios. Nat. Decad. 11, Ann. x. Obs. lxxii.

[‡] Edin. Med. and Surg. Journal, No. cxx. 1834.

[§] Ibid.

[‖] Observ. Decad. 6, cap. x.

[¶] Hist. Anat. Cent. ii. Hist. 27.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
LETTSOM.*	Urgent cough; hoarseness; dyspnœa; expectoration of dense mucus; night sweats; emaciation.	A button.	Expectoration of the button after seven or eight months, with recovery.
NOOTH.†	Sense of weight and fulness in the left side, with some dyspnœa; urgent cough; expectoration of dense mucus; hectic, and irregular pulse.	A leaden shot, one-eighth of an inch in diameter.	Expectoration of the foreign body after many months. Recovery.
BORELLI.‡	Consumptive.	A piece of nutmeg.	Expectoration, and recovery.
TULPIUS.§	Obstinate cough, with great dyspnœa.	A nutshell.	After seven years the foreign body was expelled during a violent fit of coughing.
BROUSSAIS.‖	The patient received a ball in the neck, followed by a liability to cough, without injury of his general health for six years.	A musket ball.	After seven years from the date of the accident, death, with symptoms of severe ataxic fever. For the two last years some dyspnœa, cough, and night sweats; slight pains in the chest, and a tendency to lie on the left side. The left lung was found solidified, with seven or eight abscesses. The ball was encysted, and lay near the root of the lung.

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* Memoir of the Life and Writings of Dr. Lettsom, by T. J. Pettigrew, 1817, vol. iii. p. 82.

† Transactions of a Society, &c. vol. iii. London, 1812. See also Dr. Craigie's paper. Edin. Med. and Surg. Journal, July, 1834.

‡ Hist. Med. Phys. Cent. Hist. Paris, 1656.

§ Lib. ii. Obs. vii.

‖ Histcire des Phlegmasies Chroniques, tome ii. p. 105. In this case some doubt may exist as to whether the ball was the cause of the fatal symptoms. It was perfectly encysted, and the surrounding tissue dense and callous. There was no marasmus.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
HOWSHIP.*	Sudden and incessant irritation, pain and cough; muçous and bloody expectoration; wasting; fixed pain in the right lung confined to a point; frequent hæmoptysis.	An iron nail.	After nearly four months, during a violent fit of coughing, with copious hæmoptysis, the nail was driven into the cavity of the mouth. The patient recovered, but for many years was subject to cough, with slight hæmoptysis, and pain in the old situation.
ABERCROMBIE.†	Sudden laryngeal irritation; gasping; cough and dyspnœa recurring in fits, for some time after the accident; these were succeeded by frequent cough, dense mucous expectoration and rapid pulse.	An artificial tooth.	The foreign body was expectorated in two years and seven months after its entrance into the windpipe. Much relief followed, and the patient's health and strength were to a certain degree restored; but cough and expectoration continued, with great susceptibility to bronchitis; hæmoptysis supervened; and death in the early part of the fourth year from the accident.
HOLMAR.‡	Cough; hæmoptysis; hectic; diarrhœa.	A fragment of bone, $\frac{3}{4}$ths of an inch long.	After fifteen years copious hæmoptysis occurred, followed by the expectoration of the bone. Recovery.
SUE.§	While in the act of eating a pigeon, a portion of the back bone entered the trachea; sudden acute pain below the larynx supervened. This gradually subsided, but a rattle continued, particularly on speaking. Thus she continued for	A portion of the vertebral column of a pigeon.	After the seventh year the pain changed its situation, and was felt in the upper part of the chest. The rale and hissing sounds subsided, and she was relieved from dyspnœa for four months. Violent cough and hæmop-

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[*] Practical Observations in Surgery, &c. London, 1816.

[†] See Dr. Craigie's Paper, Edin. Med. and Surg. Journal, 1834.

[‡] London Medical Journal, vol. iii.

[§] Mem. de l'Acad. Royale de Chirurgie, tome v. p. 533.

AUTHORITY.	SYMPTOMS.	FOREIGN BODY.	RESULT.
SUE.	seven years, the pain being occasionally violent, and relieved by bleeding.		tysis then supervened, which for five years recurred every two or three months. For the next three months there was only a slight pain in the chest, with some hæmoptysis. The hectic symptoms then reappeared; and after two years of great suffering *the bone was expectorated*, having remained seventeen years in the air passages. Some relief followed. Hectic and emaciation followed and death in a year and a half afterwards.

Although this collection of cases might be enlarged, it is sufficient to show the general features of the subject. We learn from it, that there is a considerable variation in the symptoms produced by foreign bodies in the air passages; and that in their symptoms no regular order or succession can be stated to exist. In almost all the phenomena supervened suddenly, and this was even observed in cases where the foreign body remained for a great number of years. In some, as in the cases by Pelletan, Broussais, Gilroy, and Houston, the symptoms were those of pneumonia; in the three first cases, followed by abscess, with fœtid and purulent expectoration, and in the last causing hepatization, with lymph on the pleura, and incipient disease in the opposite lung. These cases were all fatal. With respect to the instance recorded by Broussais, it is highly probable that the preumonia with abscess under which the patient sunk, was a recent affection, inasmuch as five years had elapsed between the receipt of the ball and the pneumonic symptoms, and the ball was firmly encysted. The patient seems to have died of typhoid pneumonia, which, as we shall hereafter find, commonly engages the left lung.

In a few, signs of chronic laryngeal, rather than of pulmonary disease, were the result, but in the great majority the symptoms were those of chronic irritation of the lung.

In many of the cases, such as those by Howship, Lenglet, Gilroy, Donaldson, and Sue, pain was felt, apparently in the situation of the foreign body, and it is interesting to observe, that in all these instances the foreign body was of a sharp and irritating nature. The same circumstances occurred in a case mentioned by Dr. Brown, of a child in whom a piece of delft was forced into the right bronchus. There was a fixed pain in the upper part of the thorax on the right side, rather below the level of the upper bone of the sternum. The operation was not permitted, and the child died on the third day.[*] But we are not to conclude that such bodies uniformly cause local pain, for in several instances where the body was of this description, local pain was absent, as in the case recorded by Houston, where the offending substance, a large molar tooth, though it produced a fatal pneumonia, did not cause any local pain.[*] In other instances no mention is made of local pain, so that it may be regarded as a symptom by no means constant. In the case by Sue we observe a remarkable change in the situation of the pain, and the symptoms correspond with the different situations of the foreign body.

The removal of the foreign body by expectoration, was not always followed by recovery; thus in the cases by Lenglet, Pelletan, Craigie, and Sue, the foreign body was expelled, and although a certain amount of relief was in some instances afforded, the patients subsequently died of pulmonary disease. Lastly we learn from the case by Sue, that even with a foreign body remaining for many years in the air passages there may be the most singular remission of all the symptoms.

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[*] An inquiry how far the operation of tracheotomy may be considered advisable in those instances in which a foreign body is lodged in either bronchus, &c. Edin. Med. and Surg. Journal, vol. xxxv. 1831.

[†] The crown of this tooth had been broken off at the first attempt of the dentist at extraction, at the second it was started from its socket, and then passed into the trachea. For the first few days the patient suffered almost nothing, for although the body lay in the right bronchus it did not altogether impede the entrance of air.

If we now examine the fatal cases with respect to the duration of symptoms we find that this is exceedingly various, whether we consider the case in which the foreign body was expectorated or those where it remained in the lung until the fatal termination: thus in Dr. Houston's case, death occurred on the eleventh day, while in that recorded by Sue eighteen years and a half elapsed after the entrance of the foreign body, before death took place, and seventeen years before it was expectorated.

It has been considered by some that a great specific gravity of the foreign body would prevent its expectoration. But although in the majority of cases, the body expectorated was of a light nature, yet instances are not wanting in which very heavy substances were thus expelled. It is true that in the case by Broussais, in which probably the heaviest body on record entered the lung, it was not expectorated, but although it is likely that even if its size had permitted it to enter the trachea in the usual way, its weight would have prevented its expulsion, yet it must be recollected, that the case was one of gun-shot wound, and that the ball was probably soon encysted. On the other hand we find, that as in the case by Nooth a leaden shot may be expectorated. In Hochsteter's case a Portugal ducat was coughed up, in Howship's an iron nail, and in Abercrombie's an artificial tooth; so that there is sufficient evidence for stating, that however great be the specific gravity, the foreign body may yet be expectorated. Finally, we may observe, that these cases afford additional evidence of the much greater liability of foreign bodies to enter the right bronchial tube.*

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* There is another class of cases of foreign bodies in the lung which I shall

In considering the application of the stethoscope and percussion to the detection of a foreign body in the windpipe or lung, we find that the diagnosis is founded on the combination of physical signs with the history of the case, and the local and general symptoms. It is true that previous to the introduction of auscultation, instances are not wanting of successful diagnosis of the accident, but in many cases the question was most difficult, and the scientific surgeon could not demonstrate the nature of the case, with the certainty requisite to convince ignorance, and remove the "*opposition meurtriere*"* on the part of other medical attendants, whose confidence was greater than their knowledge. But in the application of the stethoscope and percussion to this purpose, we have one of the most splendid examples of their utility, and to Mr. Key is due the merit of having first employed these means and of pointing out the essential physical indications.

The observations which I have to offer upon this subject have reference solely to acute cases. I have had no opportunity of examining any case in which the foreign body had remained long enough to produce consumptive symptoms.

The grounds of the diagnosis are, that in a case, the history and symptoms of which lead to the suspicion that a foreign body entered the windpipe, we discover,

1st. Signs of obstruction of the right bronchus, the obstruction being either partial or complete, permanent or intermitting.

2nd. Signs of an irritation in the right lung.

3rd. Evidence of the alternation of the *stethoscopic signs*

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merely mention, namely those in which various substances are introduced by wounds of the thorax or neck. With the exception of that by Broussais, all the cases in the foregoing table exemplify the entrance of the offending substance through the aperture of the glottis.

* Louis, Mem. de l'Acad. de Chirurgie, tom. v.

of bronchial obstruction, with the symptoms of violent laryngeal irritation and spasm.

4th. The occurrence of all or any of these signs in a sudden manner, and in a patient previously healthy.

We shall consider each of those classes of signs briefly. When, as is almost always the case, the foreign body is lodged in the right bronchus, one of two effects is produced; it either closes the tube completely, permitting no air to pass, or it lies loosely in its cavity, so as to admit to a certain degree, the passage of air into the lung. In the first case no vesicular expansion whatever can be heard in the affected side; the sound on percussion continues clear, while in the opposite lung the respiration is intensely puerile; and thus is formed a group of signs which does not occur in any other affection of the lung.

The most remarkable instance of this which I have witnessed, was in the case of a child who was brought to the Meath Hospital, with the symptoms and signs of a foreign body in the windpipe: after some hours the alternating signs of laryngeal and bronchial obstruction disappeared, and the body became fixed in the right bronchus. *No respiration whatsoever could be heard in the affected lung.* Tracheotomy was performed, but the foreign body was not expelled, nor could it be removed with the forceps. After more than twelve hours of intense suffering, it was obvious that life was fast ebbing, when after passing in a bullet probe, the foreign body, a peeled kidney bean was suddenly ejected, and recovery followed. This complete closing of the tube was also observed in the cases by Professor Macnamara.*

During this perfect obstruction of the bronchus there is no stridulous breathing, nor are any signs of bronchitis observable in the affected lung. The obstruction and its consequent signs may be permanent or intermittent, and there is not in the whole range of stethoscopy a more striking phenomenon, than the sudden rush of air into the lung, on the foreign body passing into the windpipe, or the equally sudden disappearance of all sound of expansion, natural and morbid, when the bronchus becomes again obstructed.

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* Cases of foreign bodies in the trachea. Dublin Hospital Reports, vol. v.

But the signs are different when the tube is but partially closed; we have then, in the affected lung, a murmur diminished in proportion to the obstruction.

In this way a difference of murmur in either lung, greater than natural, and incapable of being accounted for on any other supposition than that of a foreign body, is discoverable.* This difference, occurring in a case of suspicion and in a person who had been previously healthy, and coinciding with equal clearness of sound on both sides, is an important diagnostic of *partial closing* of the tube.†

The next evidence is founded on the existence of signs of irritation in the trachea and upper portion of the lung. As might be expected, a mucous irritation, spreading from the large to the smaller tubes, is soon produced, and we discover a sonoro-mucous rattle in the trachea and upper portion of the lung presenting the feeble respiration. For reasons already stated, these signs are almost always met with in the right lung, so that under the circumstances in question the sudden occurrence of bronchitic rales in the trachea and upper portion of the right lung, forms an additional diagnostic of the nature of the case. Of course these phenomena can be only met with in the lung, when the closing of the bronchus is incomplete.

The amount of this irritation will of course vary according to many circumstances, and the physical signs may proceed from the evidences of a slight bronchitis to those of congestion, solidification, and abscess.

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* It must be always borne in mind, that the vesicular murmur in the right lung is often a shade less loud than that in the left. I have found this difference most often in young females.

† There are but three affections capable of producing signs, at all similar to those mentioned in the text, these are aneurismal tumours compressing the bronchus, organic tumours of other descriptions, the obstruction of the tube by an hypertrophy of the mucous membrane, or lastly, a copious secretion of adhesive mucus or lymph. See page 136.

Observations are still wanting to shew how far the existence of a foreign body may modify the physical signs of these advanced stages of irritation.

The next source of diagnosis, namely, the alternation of the stethoscopic signs of bronchial obstruction with the symptoms of laryngeal irritation, forms, when available, the most important and conclusive diagnostic.

While the foreign body is lodged in the bronchus, at least in the early stages, the patient is in comparative ease, unless the obstruction be complete, and we observe a diminished murmur in the affected lung. But on the body being removed by coughing, and driven into the larynx, all these circumstances are changed, the suffering of the patient is extreme, his existence seems threatened by the violence of the cough and spasm, *and the lungs may be observed to be equally filled during inspiration.* After a time the foreign body may again descend, and thus alternately produce a train of phenomena not to be met with in any known case of idiopathic pulmonary disease.

I need hardly comment on the value of the last source of diagnosis, namely, the suddenness of the symptoms. We here apply to the detection of a foreign body, the principle by which internal solutions of continuity are discovered, namely the *suddenness of the appearance of new and striking symptoms in a person either previously healthy, or labouring under symptoms of a totally different class;* and in one respect there is a similarity between the accident under consideration and the internal solution of continuity, namely, the entrance into a cavity, of a substance foreign to that cavity, so that we have an analogy between the entrance of the fæcal matter into the peritoneum, and the foreign body into the trachea.

I need hardly remark, that although the sudden supervention of new and violent symptoms is seen in the majority of cases, yet it is not so constant as to be uniformly available. On the other hand, I may add, that although suddenness and violence of symptoms are generally combined, the latter is not unfrequently absent; yet here the sudden supervention of even mild symptoms, particularly if under suspicious circumstances, is of the utmost value in diagnosis.

Hitherto we have studied the signs of foreign bodies in the air-passages, with reference to their lodgment on one side, so as to admit of the diagnosis by comparison. I shall now detail a case in which the trachea itself was obstructed, producing similar phenomena on either side.

A gentleman aged twenty, who had previously enjoyed the best health, while conversing in the act of eating a piece of cheese after a hearty dinner, suddenly fell from his chair in a state of insensibility. On the supposition that a foreign body had become fixed in the œsophagus, a probang was speedily passed, and after about ten minutes he partially recovered, Soon after, however, the attack recurred with great violence, the face was strongly congested, and the breathing spasmodic and stertorous. He was then freely bled, but no improvement followed. Stimulating injections and a second bleeding were employed, but still without relief, the situation of the patient becoming every moment more critical. A loud rattling in the throat now supervened. The patient tossed himself on the bed, and threw his arms about so as to extend the chest as much as possible. All the muscles of inspiration were in the most violent action; and the surface of the body became pale and cold. Hours had now elapsed: the failure of all means employed led to the suspicion that the case might be one of asphyxia from tracheal obstruction, and a stethoscopic examination having been made, the following circumstances were observed.

The chest sounded everywhere clear, but the vesicular murmur could scarcely be perceived in any portion of the lungs, the feebleness being equal and universal, notwithstanding that the patient made the most violent efforts of inspiration. A loud sonoro-mucous rattle, every moment increasing, was heard in the trachea, while the slight dilatation of the chest compared with the respiratory efforts clearly pointed out some obstruction in the windpipe.

The question then arose, what was the nature of this obstruction: had a morsel of food passed into the trachea, or were the symptoms produced by a spasm of the glottis, consequent on cerebral irritation. The failure of treatment calculated to relieve the brain, and the evident secretion into the trachea, as shewn by the loud rattle at the top of the sternum, were strongly in favour of the first opinion, and it was obvious that as the patient was dying of laryngeal or tracheal obstruction, something should be done to give immediate relief. The operation of tracheotomy was then performed, and a crucial incision made through the tube, and on the angular portions between the incisions being removed, a mass of pultaceous matter was forcibly ejected through the opening, with complete and instantaneous relief to the symptoms. Respiration became easy, the expansion of the lung full and audible, the patient breathed through the glottis, and recovered without a bad symptom.

In about four weeks, however, he was attacked with symptoms of cerebral irritation, and had a fit resembling epilepsy; during the next three months these attacks recurred several times, becoming gradually less severe. They then altogether subsided; and for the last four years he has had no return of the disease. The treatment consisted in small bleedings, cold to the head, and the use of turpentine.

It must be confessed, that there is some difficulty in coming to a conclusion as to the nature of this case, yet although its subsequent history, and the fact of the foreign body not being producible, seem to favour the idea that the disease was from the first cerebral; there are circumstances which prove that it was in reality one of foreign body in the trachea, and that many of the symptoms during the attack were caused by obstructed respiration.

In the first place, the attack came on while the individual was eating, and at the same time conversing, circumstances likely to cause the entrance of a foreign body into the windpipe.

2nd. Although in certain cases of disease in children and in adults of a high nervous temperament, spasm of the glottis is symptomatic of cerebral disease, yet in a young and robust man such a symptom is exceedingly rare.

3rd. We have the important symptom of copious secretion from the mucous membrane. I believe that this is quite conclusive against the opinion that spasm of the glottis existed; such an occurrence is not seen in the nervous affections of the tube, but as one of the symptoms of a foreign body in the trachea, and resulting from its direct irritation, it has the highest value.*

4th. The result of the operation may well be appealed to; sudden and complete relief followed the expulsion of a soft matter from the trachea, which, from its nature, and the violence of its expulsion, was scattered so as to render it impossible to obtain it, but *the patient breathed easily through the glottis,* from the moment of the operation. No means were used to keep the orifice open, and unless the making of a wound in the trachea could be supposed capable of relieving violent and increasing cerebral disease, there is no alternative but the belief in the existence of a foreign body.

5th. It must be recollected how completely the physical signs and history of the case coincide with the phenomena which a foreign body would produce. For myself I have no doubt of the true nature of the case, and consider it as a decided example of foreign body in the air passages.

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* Of this symptom, Pelletan says "une ralement, signe characteristique de la maladie."—*Clinique Chirurgicale.*

But without impugning the foregoing observations, or the operation, we may take another view of the case, and inquire whether the original attack was not really cerebral, and that the foreign body entered the windpipe during the convulsion.* To this opinion Mr. Read, who treated the case throughout, now inclines. The question is a difficult one: the subsequent history of the case tells both ways; for we might expect that after such a violent and protracted struggle, some cerebral injury would be inflicted; and the complete disappearance of the attacks after three months strengthens the opinion, that they were but the echos of the first invasion, which was induced by the mechanical impediment to respiration.

As illustrative of some novel and curious points in the history of foreign bodies in the windpipe, the following case, abridged from the paper of Professor Macnamara, has considerable interest.†

A boy was brought to the Meath Hospital on the 5th of *September*, 1829. It appeared that three days before, he had been whistling through a plumb-stone, which was perforated upon each side, and the kernel removed, this being placed across the lips passed during a strong inspiration through the glottis, and became fixed transversely in the larynx. So little inconvenience did this produce, that on his finding even in this situation he could whistle through the stone, he went about for some hours, pleased with his new and convenient mode of producing sound. During three days previous to his entrance into hospital, he suffered but little inconvenience, except that he was now and then disturbed with suffocative cough, but he was able to run about, and occupy himself in his childish amusements. On admission he did not complain of pain on deglutition. He said that the cough caused pain in his throat, but only during severe paroxysms: he had a dull pain in the epigastrium, a bloated countenance, and a pulse at 106. The fits of coughing resembled those of suffocative catarrh, and were followed by white frothy expectoration. Chest clear on percussion, and the vesicular murmur natural. In this case the whistling sound in the trachea being sufficient to establish the diagnosis, the operation of laryngotomy was performed, but during the struggle and convulsive cough which followed the opening, the patient declared that he had coughed up the stone and swallowed it.

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* It has been found that in animals that have been killed by a blow on the head, portions of food pass into the trachea.—See *Med. Jurisprudence, by Paris and Fonblanque.*

† For permission to publish these particulars, I am indebted to Mr. Read, President of the Royal College of Surgeons, to whose judgment and decision in this most embarrassing case, I feel happy in bearing my testimony.

That such was the fact seemed to be proved by the relief of the symptoms, and the disappearance of the whistling; but it was found that according as the wound healed, the distress and whistling sound returned, proving that the foreign body must have been placed above the opening, and that the disappearance of the whistling in the first instance, was owing, not to a removal of the foreign body, but to the admission of air below the point in which it was fixed. Soon after this it was found to change its situation, and to pass down the right bronchus, again to be driven upwards into the larynx. By a second operation it was finally extracted, and the patient recovered without any bad symptom.

From what has been now stated it would appear,

1st. That bodies of greater volume than the ordinary size of the glottis would seem to admit, may be forced through that aperture by the efforts of inspiration.

2nd. That the foreign body may remain impacted in the glottis, or become entangled in the cavity of the larynx; it may remain in the trachea either free or fixed, or pass into either bronchial tube.

3rd. That the cases in which it enters the right bronchus are so much more numerous than those in which it occupies the left, as to make the signs of irritation and obstruction of the right lung, important diagnostics of the accident in question.

4th. That the symptoms vary according to the situation and form of the foreign body.

5th. That the diagnosis depends on a careful comparison of the history and symptoms of the case, with the physical signs.

6th. That the physical signs depend

a. On the situation of the foreign body.

b. On the amount of obstruction which it offers to the entrance of air.*

c. On the irritation of the mucous membrane which its presence causes.

7th. That when the foreign body remains in the larynx or trachea, its physical signs are more obscure than when it occupies but one bronchus, there being no difference of phenomena in either lung.

8th. But that when it enters the bronchus it may close the tube either partially or completely.

9th. That hence the vesicular murmur in the corresponding lung is either greatly lessened or altogether extinguished, while the sound on percussion remains the same, and the opposite lung presents the puerile respiration.

10th. That the signs of partial or complete obstruction of the tube may suddenly disappear, and as suddenly return.

11th. That in cases where the foreign body has completely obstructed the bronchus, its passage into the trachea is followed by a return of vesicular murmur in the affected lung.

12th. That the physical signs of irritation, consisting in a sonorous, or sonoro-mucous rattle, may be found at the top of the sternum, and in the situation of the right bronchus.

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* Some have stated that they have been able to hear a sound produced by the movements of the foreign body in the trachea itself. Indeed I once believed that I had heard this sound, but as further observations seem necessary to establish it, I have not included it in the list of physical signs.

13th. That the physical signs in the commencement are those of mucous irritation, varying according to the physical changes of the lung.

14th. That the physical signs of irritation precede the constitutional disturbance.

15th. That in the alternation of the stethoscopic signs of bronchial obstruction, with the ordinary symptoms of laryngeal distress, we have a most important diagnostic of the accident in question.

16th. That in certain cases, the bronchial obstruction (hitherto observed only in the right tube) differs from all other examples of the same physical condition from other causes, in its being so complete and sudden.

17th. That the sudden appearance of irritation of the larynx and bronchus, in a patient who had before presented no evidence of thoracic disease, is strong evidence that a foreign body has entered the air-passages.

18th. That a foreign body may be immediately expelled by coughing, or remain in the air-passages so long as seventeen years.

19th. That where a foreign body becomes lodged in the bronchial tube, it causes symptoms of acute irritation, or of more chronic disease.

20th. That in the acute cases, the patient may die of pleuropneumony, without suppuration of the lung.

21st. That in other cases an abscess is formed, and the patient has fœtid and purulent expectoration.

22nd. That in the more chronic cases, there is a predominance of either laryngeal or pulmonary irritation.

23rd. That in the latter case, hæmoptysis, emaciation, and hectic are commonly observed, while in a few instances, the symptoms have more of an asthmatic character.

24th. That the situation of the foreign body may be pointed out by local pain, but that this is not a constant symptom, even when the body is of an irritating nature and irregular form.

25th. That the removal of the foreign body is not always followed by recovery from the symptoms which it has produced.

26th. That an almost complete remission of the symptoms, even for years, may occur, although the foreign body still remains in the lung.

27th. That a great specific gravity of a foreign body does not prevent its expectoration.

As the treatment of this accident is essentially a surgical question, I shall not discuss the subject at any length. It has been proposed to use emetics in such cases, and instances are on record, where the use of stimulating and emetic medicines, was followed by the expulsion of the foreign body. On the other hand, such treatment has frequently failed; and when we consider the formidable nature of the accident, and the importance of a speedy extraction, it seems unjustifiable to delay the operation. It must be recollected, that circumstances favour the entrance of a body through the glottis, much more than its expulsion; for in the first case, the aperture is dilated to its greatest extent, and the body carried in by the force of the inspired air, while in the second, it must be expelled during expiration, when the irritation on passing through the larynx will probably produce a spasmodic closing of the glottis. Under these circumstances, by causing the offending substance to become impacted in the glottis, the act of vomiting might produce sudden death. Let us further recollect, that the foreign body may not be presented to the rima in the same position as that in which it entered.* A plumb stone may pass through the glottis with ease, because it enters with its longest axis foremost, when were it placed transversely, it could never pass the aperture. Now the expulsion of such a body by vomiting, would require that it should be presented to the glottis in its first direction, and it is obvious, that we have no means of insuring such a result. We learn from the case by Professor Macnamara, that even after such a substance has lodged in the bronchus, in which, as shewn by the physical signs, it must have lain in the direction of its longest axis, it may, when driven into the trachea or larynx, change its direction, and lie transversely in the tube.

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* Surgical Pathology of the Larynx and Trachea, p. 204.

If there be any case in which the emetic plan would appear justifiable, it would be that of a foreign body much smaller than the glottis during expiration; of a smooth surface and rounded form, and one not likely to increase in bulk by remaining in the air passages. An inspection of the table which I have given, will shew how rarely such a combination of circumstances will be met with; and it must be always recollected that the earlier the operation is performed, the better the chance of success, whether we consider the extraction of the body, or the prevention of the consequent injurious results on the lung, windpipe, or brain.

On the performance of tracheotomy in these cases, and the different modifications of the operation, I refer the reader to the writings of Louis,* Desault,† Pelletan,‡ Burns,§ Porter,‖ and Brown.¶

TUMOURS EXTERNAL TO, AND COMPRESSING THE WINDPIPE.

Under this head may be classed many affections, which though agreeing in their physical effect on the trachea, yet differ greatly in nature, and consequently in their progress and symptoms.

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* Memoires de l'Acad. Royale de Chirurgie, I. xii.

† Œuvres Chirurgicales, tome ii.

‡ Clinique Chirurgicale, tome i.

§ Surgical Anatomy of the Head and Neck.

‖ Op. cit.

¶ Edinburgh Medical and Surgical Journal.

We may classify these tumours as follows:

a. Tumours of the neck.

b. Deap seated tumours.

Under the first class we may place,

1. Abscess of the neck.
2. Hydrocele of the neck.
3. Enlargement of the lymphatic glands.
4. Hypertrophy of the thyroid.
5. Aneurism of the carotid and thyroid arteries.
6. Solid tumours of the neck; often of a malignant nature.

In these cases, the situation of the disease at its commencement is above the clavicles. In the next class, however, although the tumours may rise up so as to deform the neck, and dislocate the windpipe, yet the disease begins within the chest and proceeds upwards. Of these tumours the following have been observed:

1. Aneurisms of the aorta and innominata.
2. Cancerous tumours of the posterior mediastinum and lung.
3. Hypertrophy of the bronchial glands.
4. Melanotic and tuberculous alterations of these glands.
5. Hypertrophy, and other diseases of the thymus.

Considered with relation to the trachea, we find, that between the first and second class of tumours, there is a difference with respect to the probability of compression. In the first case enormous tumours may form without encroaching on or displacing the windpipe, a fact explicable by the yielding of the integuments of the neck, so that unless in some cases of bronchocele, and hydrocele of the neck*, we seldom witness tracheal compression from tumours which have sprung from above the clavicle.

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* This disease, consisting in the formation of a number of aqueous cysts in the neck, which increase so as to form a tumour of considerable size, was first accurately described by Professor Maunoir of Geneva, in his memoirs entitled,

But in the second class the circumstances of the tumour are different, and we find it surrounded by resisting parietes, no matter whether it has sprung from the anterior or posterior mediastinum. Confined anteriorly by the clavicles and sternum, its pressure must be directed inwards, so as to engage not only the windpipe, but the great blood vessels, while on the other hand should it grow from behind forwards, it has the spine and posterior portions of the thoracic walls to force it against the same parts. These considerations explain why the tumours of the first class so rarely cause tracheal breathing, and why this with other evidences of compression is so common in the second.

It must be borne in mind, that although the symptoms of tracheal compression and distress are a frequent result of these diseases, yet that they are not necessarily present in any of them, and in many only appear in the advanced stages. In these cases the phenomena referrible to the windpipe are few, but striking.

They may be comprehended under the heads of compres-

Sur les Amputations, l'Hydrocele du Cou, et l'Organization de l'Iris, Geneva et Paris, 1825. The only other author who has written on this subject is Dr. O'Beirne of this city, who has given several cases similar to those by Maunoir, and successfully treated on the principles of the Genevese Professor.—See the *Dublin Journal of Medical and Chemical Science*, vol. vi. 1835. It would appear that the original memoir was neglected, in consequence of the celebrated Baron Percy having reported unfavourably of its merits to the Academy of Natural Sciences in 1817.

This disease is essentially different from bronchocele, as after the evacuation of the tumour, the thyroid has been found perfectly healthy. The tumour may enlarge so much as to seriously interfere with respiration and swallowing, as was the case in several of the instances related by Maunoir. In those by Dr. O'Beirne, the respirarory function was not injured, which may be explained by the fact, that in his cases the disease occupied the side rather than the front of the neck, while in most of Maunoir's examples, the tumour, though commencing at the side, had extended to the front of the neck, so that its weight oppressed the trachea.

sion, displacement, and lesion of innervation. In most cases where one of these phenomena is met with, others either accompany or speedily follow it, and in their invasion, succession, and mutations, there is the greatest variety, not only among cases of different natures, but even those of the same disease. I have found in most cases, and I think it will be found in all, that when the symptoms of tracheal compression can be observed, the signs of pressure on other parts are also evident. The patient may have dysphagia, turgid jugulars, or displacement of the lung, and these indications will be often observed to vary with those referrible to the windpipe: at the same time the existence of one of these evidences of compression does not necessarily imply that we shall then meet with the others; dysphagia may occur without tracheal breathing, and so on with the rest.

In almost all the intra-thoracic tumours, their phenomena are in the first instance manifest at one side; thus we may often see one jugular distended and tortuous, while the other remains natural or nearly so; an observation of great interest, as giving a diagnosis between these partial obstructions referrible to compression or obliteration of a venous trunk, and those produced by disease of the heart.

In the instances of œsophageal and pulmonary compression, the same may be observed. The patient often feels that the obstruction to his swallowing is at one side; and with respect to the lung, I have always found that the pressure of the tumour is greatest at one side, a point easily demonstrated by the stethoscope. In more advanced cases these circumstances of course change. Thus when the vena innominata becomes compressed, distention of both jugulars is observed, and a tumour, which at first only compressed a bronchus, may affect the trachea itself.

Although this pressure on the trachea must, from an early period, cause more or less of dislocation, yet this is not perceptible until the tumour rises high up and appears above the clavicles. We may then find that the windpipe will be pushed far to the opposite side. In a case of aneurism of the innominata, I have seen the thyroid cartilage so displaced from the mesian line, as to correspond with a line drawn from the posterior angle of the jaw, to the humeral portion of the clavicle. The right carotid, the jugular, and vena innominata, were obliterated, and the vagus atrophied and stretched.

But much of the displacement depends on whether the clavicle is dislocated by the tumour. This may or may not occur; and it is hardly necessary to observe that in the latter case, all the sufferings of the patient are greatly aggravated. In the case to which I have just now alluded, there was no yielding of the clavicle, and the consequence was the extraordinary displacement just mentioned. On the other hand, we observe, that where great suffering from pain, dyspnœa, stridor, and dysphagia have existed, the dislocation of the clavicle, by allowing room for the tumour to expand, has been followed by the temporary cessation of all these symptoms.

The last general observation I shall make here is with respect to the symptom of stridulous breathing. It is this which so commonly leads to the error of confounding these cases with chronic laryngitis; but as I have already remarked, it is often easy to observe from the sound produced, that the obstruction is not in the larynx, but really much lower down. The stridulous sound seems to come from the upper portion of the sternal region, and if to this we are able to add the observation of the previous inequality of respiration in the lungs, the diagnosis will in general be an easy one.

On the subject of alterations of voice, I regret that I have but few cases in illustration. In a case of aneurism I observed that the tone and character of the voice underwent a series of changes quite unlike anything observable in chronic laryngitis. It was scarcely two days the same, and presented alternations of the most remarkable acuteness, with the deepest tone; on one day great hoarseness would be observable, which would be succeeded by a shrill whisper, and this would be followed by a return of the voice to its natural tone. These circumstances, easily reconcileable with the existence of an irritation or intermitting paralysis of the recurrent, are quite different from those observable in chronic laryngitis.

Of the different tumours enumerated, the aneurismal are those which most frequently simulate laryngeal disease. This may be explained by their greater frequency, the height to which they often ascend in the neck, and their close relation to the windpipe. Their pressure causes a stridulous breathing, which like that of chronic laryngitis, is variable in its intensity, while their action on the recurrent nerve, producing hoarseness or aphonia, completes to the superficial observer the picture of laryngeal disease.

It would seem that the effect of pressure on the trachea, varies according to the direction in which it is applied. When we consider the structure of the tube, we may compare it to an arch, the convexity of which looks anteriorly, and whose apex is at the mesian line. Here then is its point of greatest strength, and it is here that it has the greatest power in resisting the pressure of external tumours. Thus I have seen a case of violently pulsating aneurism of the aorta, in which the posterior portion of the sac had been absorbed, so that the rings of the trachea formed a part of its walls, and corresponded to the centre of the tumour, in which notwithstanding, there was little or no tracheal distress, nor was the form of the tube perceptibly altered. On the other hand, I have found that in all the cases where aneurismal simulated laryngeal disease, the pressure on the windpipe was from the first lateral, or in the direction most likely to diminish the calibre of the tube, and engage the recurrent nerve.

When pressure is thus exercised on the trachea, the ends of the rings next the tumour are bent inwards, and the musculo-membranous portion folded upon itself; and though their direction is changed, the ends of the rings are approximated, and the calibre of the tube diminished. If we now examine the recorded cases of aneurism, with respect to the direction of their pressure on the trachea, we shall find that those in which the pressure was lateral greatly preponderate over the others, a fact of great importance in diagnosis.

Without entering into the subject of aneurisms in general, which will of course occupy a separate chapter, I shall here point out briefly the grounds of diagnosis between laryngeal disease and the pressure of an aneurismal tumour on the trachea; of course I do not mean to state that the following phenomena occur in all cases, but some of them are always present.

1st. *Evidence of internal pressure.*

a. Signs of compression of one bronchus.

b. Dysphagia, always deep seated.

c. Turgescence of one or both jugular veins.

d. Œdema of the neck.

e. Signs of displacement of the lung.

2nd. *Evidence of solidity more or less extensive in the upper portion of the thorax.*

a. Dulness of sound of the upper sternal or either clavicular regions.

b. Bronchial or tracheal respiration, in the situation of the dullness.

c. Loud resonance of the voice in the same situation.

3rd. *Proper signs of an aneurism, such as pulsation, bellows murmur, &c. &c.* generally observable in the sternal, or subclavicular regions.

4th. *Difference of the radial pulse.*

I feel no doubt that were these points carefully attended to, it would rarely happen that so great a mistake as the confounding an aneurism with a chronic laryngitis, would ever be committed.

CANCEROUS TUMOURS OF THE POSTERIOR MEDIASTINUM.—I have seen two instances in which this disease produced symptoms, not unlike those of aneurismal tumour. In one case, indeed, the stridulous breathing *from below* was well marked, and the tone of the voice altered. As I intend, however, to devote some pages to this disease, I shall for the present omit its further consideration.

DISEASES OF THE BRONCHIAL GLANDS—Although as yet no separate investigation on this subject exists, yet from the cases recorded by various authors, we may conclude, that these glands, when hypertrophied or otherwise diseased, seldom produce any striking symptoms. Thus in a case recorded by Andral, where an enormous mass of melanosis compressed the right bronchus, so as to diminish its diameter by one half, there was no stridulous breathing, the signs being a feeble respiration in one lung, with intense puerility in the other;* and Berton, who is the latest author upon the subject, dwells strongly on the fact, that the bronchial glands may be greatly hypertrophied without causing compression of the blood-vessels or air tubes. Andral, however, states that tumours of of the bronchial glands, frequently cause tracheal and bronchial compression. I myself have never met with any instance of stridulous breathing, or even bronchial compression, produced by this disease, but the subject requires a more extended investigation. It is obvious, however, that so far as the question between laryngeal disease and the existence of a tumour compressing the trachea is concerned, the diagnostics which apply to aneurism, with the exception of its proper signs, are equally available in the case under consideration.

ENLARGEMENTS OF THE THYMUS GLAND.—As this affection has been frequently noticed in connexion with lesions of the respiratory function, we may take a brief review of the subject, which from the researches of Sir Astley Cooper,* in this country, and of M. Haugsted† on the continent, has acquired the greatest interest.

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* Clinique Medicale, tome i.

Placed in the closest relation with the trachea, and great arterial and venous trunks, and not unfrequently extending so high as to be connected with the thyroid, and even to touch the larynx, and furnished with arteries, veins, absorbents, and nerves, which latter seem connected with one of the most important nerves of respiration, it is not surprising that in its morbidly large and otherwise diseased condition, it should excite severe symptoms, the more important, as they will be commonly observed in the scrofulous constitution.

In order to give clear ideas on this subject, a short sketch of the developement of the thymus may be here introduced: this gland, the functions of which are still to be established, is obviously connected with the conditions of infancy, and like other organs connected with the progressive developement of the body, each phase of its evolution may be observed, and its perfection, decrease, and disappearance be followed out through their different stages.

The researches of Haugsted have shewn that the thymus has its greatest developement within a certain period after birth, and that it is not one of those organs which acquire their highest developement at the period of fœtal life, and from the moment of birth become useless and begin to decrease.

More exact observations have shewn that the thymus does not begin to diminish from the first period of extra-uterine life, but until the age of one or two years, it grows with the other organs of the body, and at the end of that time attains its greatest magnitude.* From this period, until the eighth or tenth year, the volume of the organ undergoes but little change, a point of physiology in which Haugsted is opposed to the authority of Meckel,† Burdach, ‡ and Hewson.§

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* The Anatomy of the Thymus Gland, by Sir A. Cooper, London, 1832.

† Thymi in Homine ac per seriem animalium, descriptio anatomica, pathologica, et physiologica, &c. Auct. F. C. Haugsted, 1832. See also Archives Generales de Medicine, 1834.

But although its volume remains unaltered, some change takes place in its structure; its cells become smaller, and their fluid contents are diminished; its specific gravity becomes less and less, yet it continues to live, and its vessels are not obliterated; nor is it until the second period of childhood, when the permanent teeth have been developed, that the process of atrophy decidedly begins. From the twelfth to the sixteenth year, the changes of the organ are rapid, until it is completely atrophied, and nothing left but some adipose tissue, and a few particles of brownish matter.

This process seems to commence inferiorly, and proceed upwards, so that in the adult the last portion is found under the upper extremity of the sternum.

I shall not apologize for introducing the following table, abridged from that of M. Haugsted. It is constructed so as to shew the size of the human thymus at different ages.

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* See on this subject the work of Verheyen, Anat. Corp. Hum. tract, iii. cap. vi.; also Morand. Mem. de l'Acad. des Sciences, 1759, who denies the doctrine that the thymus is obliterated as soon as the infant breathes.

† Manuel d'Anat. Gen. Descript. et Pathol. tome iii.

‡ Die Physologie als Erfahrungswissenschaft.

§ Experimental Inquiries, vol. iii. p. 87.

AGE.	THYMUS.			
	Length.	Breadth.	Thickness.	Weight.
A newly born child well developed, (female.)	1½ line to 3 inches.	1 to 2 inches.	2 to 4 lines.	240 Grains.
—— small and thin, (male.)	1⅘ of an inch.	½ to 1½ inch.	2½ lines.	84 Grains.
A male child small and thin, of *four weeks*.	2 inches.	7 to 9 lines.	2 lines.	120 Grains.
—— strong and well developed, of *nine months*.	2½ inches.	1½ inches.	4 lines.	270 Grains.
—— scrofulous, of *ten years*.	2½ to 3 inches.	1 inch.	1½ lines.	110 Grains.
A female, thin and scrofulous, of *ten years*.	2 to 2½ inches.	7 lines.	1 line.	36 Grains.
A boy, of *seventeen years*.	1¾ inch.	¾ of inch.	¼ of an inch.	90 Grains.
—— of *twenty-one years*.	..	..	..	40 Grains.

In the present state of our knowledge we may enumerate the diseases of the thymus, which have produced laryngeal symptoms, as follows: enlargement, inflammation, and tuberculous degeneration; of these several examples are recorded.

In almost all these instances, the symptoms produced were those of dyspnœa and croupy breathing, varying in their mode of invasion and character, according to the age of the individual; thus in young children, the disease which has got the name of the asthma infantum, the crowing disease, spasm of the glottis, &c. &c., has been occasionally found to co-exist with an enlargement of the thymus gland; this fact is alluded to by John Peter Frank, and more recently by Kopp, who has given to this disease the name of asthma thymicum.

In this affection it is held, that any sudden emotion, causing a quick or forced inspiration, may bring on an attack of dyspnœa and suffocation, and even in some case convulsions, so that in this way sudden death may supervene in a child, to all appearance perfectly healthy.

As yet the etiology of this disease is by no means established, and further researches are necessary to show how the condition of the thymus produces so remarkable an effect; does it take an active part in these attacks, or is its permanent enlargement a passive cause for the injury? No data exist to answer these questions, but from the similarity of cases of the crowing disease, with those in which an enlarged thymus has been found, it seems probable that a morbid state of the thymus takes occasionally some part in causing the symptoms of Miller's asthma infantum.

But with respect to the cases of sudden death in infants, in whom an enlarged thymus gland has been found, we are not yet justified in attributing the death to this cause. The symptoms, if proceeding from pressure on vessels or nerves, must result from a sudden, an almost instantaneous enlargement of the gland; yet its low innervation, its structure, and scanty supply of vessels, militate strongly against the chance of such an occurrence. The thymus has little analogy with the erectile organs; in these structures we observe large vessels, an highly vascular structure, and a great sensibility; but in the thymus nothing of this kind occurs, and the subsidiary apparatus of erection is wanting.

If the measurements of Haugsted be correct, we must be cautious how we take the natural for the diseased volume of the gland. That this has been done with other organs, we have abundant evidence of; and it is yet to be proved whether the coincidence of the symptom in question with the appearance on dissection, has not been accidental.

The enlargement of the thymus may be met with alone, or in combination with other anormal states, of which the most remarkable is the persistence of the fœtal condition of the heart. Thus in many of the recorded cases the foramen ovale was found open, so that one arrest of developement was associated with the other. But this is by no means constant, and as has been before stated, the enlarged thymus may exist in a child otherwise healthy.

When the gland, however, becomes indurated and otherwise diseased, it may produce even in the adult all the formidable symptoms of pulmonary and tracheal compression, and thus induce death by asphyxia.

In a case of this kind recorded by Sir A. Cooper, the patient, a young female, suffered under severe dyspnœa in the recumbent position; and if she fell asleep she started up in a few moments, and struggled violently for breath. A large tumour was found to occupy the inferior part of the neck, projecting above either clavicle; this had existed many years, but of late had suddenly increased. The symptoms became more and more distressing, until at length she could only breathe with her head inclined forwards and supported by assistants.

In this case, the thymus was found greatly enlarged, extending from the curvature of the aorta to the thyroid. The trachea was compressed,* and its transverse diameter lessened.

As no stethoscopic examination in a case of diseased thymus has yet been published, the physical signs must remain undetermined. It is obvious, however, that the principles of diagnosis of other intra-thoracic tumours, will apply to the chronic enlargements of the thymus gland.

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* Sir A. Cooper considers both the thymus and thyroid to have been diseased in this case.—*The Anatomy of the Thymus Gland, &c. London.* 1832. It will probably be found, that these diseases are often associated; and the complication may exist in those cases of bronchocele, in which stridulous breathing occurs at an early period. In Haugsted's memoir, we find references to cases similar to this. Thus in one described by Meckel, the paroxysms, as in Sir A. Cooper's case, increased after an interval of great remission. He quotes a remarkable instance from Tozetti, *Raccolta di opusculi Med. Pract.* in which the disease had continued for twenty years, and terminated in dropsical effusions; the thymus weighed some ounces. Other instances are given, so that there is sufficient evidence to lead to the suspicion of the disease, in certain cases of dyspnœa, without apparent cause.

SECTION IV.

PNEUMONIA.

IF we inquire into the anatomical nature of this disease, we find that the line of distinction between it and bronchitis is undefined, and it becomes difficult to say where bronchitis ends, and pneumonia begins. The statement that the first is an affection of the mucous membrane merely, while the second engages the parenchyma, is satisfactory only to the theorist or superficial inquirer. When we find that this parenchyma is made up almost altogether of air cells and minute bronchial tubes, and when we examine a lung which has passed into the more advanced stages of pneumonia, and observe the filling up and distention of the cells, and the exudation into, and obliteration of the minute tubes, we must admit, that he who would call pneumonia a bronchitis of the terminal tubes, would be hardly guilty of a misnomer.

We may describe pneumonia as the inflammation of the cells and minute tubes, and believe that it differs from bronchitis in the ordinary acceptation of the term, merely in the occurrence of the phenomena of a parenchymatous inflammation, such as solidification, suppuration, and abscess, phenomena not proceeding from any inherent difference in the diseases, but a result of anatomical structure. The close approximation of the cells and minute tubes is so increased by the disease, that parts which in health are separate, such as the pulmonary lobules, unite under the influence of a morbid action, and a solid is formed out of a cellular, or tubular structure.* Like the other inflammatory diseases of the lung, pneumonia may occur as a primary or secondary affection, and its characters must be studied with reference to this distinction.

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* I do not deny the influence which the inflammation of the inter-vesicular, and inter-lobular cellular membrane may have in giving a character to pneumonia different from bronchitis. This tissue, however, is so sparingly supplied, in com-

ACUTE PRIMARY PNEUMONIA.

Before entering on the diagnosis, I shall first examine the different stages of this disease.

Laennec has described three stages of pneumonia with their corresponding symptoms and signs, and his statements have been verified by all subsequent experience. In his first stage, the lung is engorged with blood, and a crepitating rale is heard; in the second, solidity takes place, with its accompanying physical signs; and in the third, we find the interstitial suppuration of the lung, or the condition which precedes the formation of abscess.

Without impugning the accuracy of this description, we may inquire whether a stage previous to that which Laennec calls the first, does not exist. The following considerations seem to prove that Laennec's first, is really the second stage of the disease.

No one can doubt that the crepitating is but the diminutive of the mucous rale, it is a phenomenon produced by the passage of air through a viscid fluid, secreted by the irritated cells, or terminal tubes, and its peculiar characters result from the bubbles being necessarily so minute. The existence of this sign, then, points out that secretion has taken place into the cells and minute tubes; so that Laennec's first is in reality the secretive stage of the inflammation, and every analogy favours the opinion that a stage of irritation has existed, previous to the secretion which caused the crepitus.

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parison with the air cells and minute tubes, that its affections are probably of little importance, and its participation would give no *pathological* difference between the two diseases.

Further, I have repeatedly seen a condition of the lung, which seems really the first stage. The pulmonary tissue is drier than usual, not at all engorged, as in Laennec's first stage, and of a bright vermillion colour, from intense arterial injection. I have found this condition in the upper portions of lungs, in the middle and lower parts of which Laennec's first and second stages existed. It is obvious that this appearance will be but rarely met with, as a more advanced stage occurs before death; and it is often obscured by cadaveric congestion. I have found it in cases of pneumonia, where death occurred from other causes. In a child who died of an extensive burn, we found nearly the whole of the lung in this state; and I have seen the same condition in subjects who died of acute phthisis, with severe inflammatory symptoms.

We may hence enumerate the stages of pneumonia as follows.

1st. The lung drier than natural; with intense arterial injection. No effusion of blood into the cells.

2nd. (Laennec's first.) The cells engorged with blood. No change of structure.

3rd. (Laennec's second.) Solidity and softening. (Ramollisement rouge of Andral.)

4th. Interstitial suppuration.

5th. Abscess.

On the subject of Laennec's first stage, it is to be observed that it does not necessarily precede hepatization. We may have complete solidity produced in a lung that has never presented the crepitating rale, and the disease pass on into the stages of suppuration and abscess. This circumstance, so important in diagnosis, is met with in certain cases of the typhoid pneumonia, in which a sudden and extensive congestion of blood affects the lung. It may then occur, that a lobe which to day was perfectly permeable, and presenting no morbid signs, shall in twenty-four hours be solidified, and present dulness with absence of vesicular murmur, broncophonia, and bronchial respiration.

Such cases, however, are comparatively rare, and I need hardly observe, are full of danger. The suddenness and extent of the solidification, and the prostrated condition of the patient, combine to increase the danger, and in some cases give rise to a rapid gangrene. I have never seen this rapid congestion, or solidification, in the ordinary sthenic pneumonia. All the cases were examples of a secondary disease of the lung, supervening on typhus fever, or that condition of the system in which diffuse inflammations are liable to ensue. Thus it is seen in cases of bad erysipelas, and often in connexion with analogous diseases of other viscera. Its most frequent termination is in the stage of interstitial suppuration, but in two cases I have known a gangrenous abscess to be rapidly formed; and when we reflect on the circumstances of the disease, such a termination seems easily intelligible.

The third stage* of the disease, according to my views, is but the maximum of the second; and we must agree with Andral in the opinion, that the solidity of acute pneumonia, arises not from any deposition of lymph, but merely from an excessive congestion of blood. Indeed any one who has witnessed the rapidity with which all the phenomena of solidity will appear and subside, must be of this opinion. In the course of twenty-four hours a lung which was perfectly free from morbid signs, may become dull, and its vesicular murmur be exchanged for bronchial respiration: and the picture is often reversed, and we see these phenomena as rapidly disappearing under the influence of treatment, or a metastasis of disease.

Here it is necessary to remark, that although the sudden solidification is peculiar to the typhoid or secondary pneumonia, yet that we may observe the rapid resolution of the disease in the primary and sthenic cases.

I have nothing of importance to offer on the subject of the interstitial suppuration of the lung, and shall pass on to consider the fifth stage, or that of abscess.

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* Laennec's second, or that of hepatization. (Ramollissement rouge.)

It is not difficult to understand why this instance of visceral abscess should be so rarely met with; inflammation is rarely circumscribed in the lung, and hence one important condition for the formation of abscess is wanting. From the spreading of the disease, it happens, that by the time the lower portion is about to form abscess, the upper is often solidified, and the disease extending to the opposite lung, death occurs before an abscess can be formed; the fatal result being induced less by the suppuration, than the earlier stages of disease.

But it is in the anatomical structure of the lung that we find the true explanation of the point in question. If we compare the viscera with respect to the liability to form abscess, we find that in those in which the earlier products of the inflammation can be got rid of, there is the least liability to abscess. In the brain, which has no excretory duct, abscess is a common result of inflammation; abscess of the liver is less common than that of the brain, and more so than that of the lung; abscess of the kidney may be placed next in the scale, and that of the lung decidedly the last in the order of frequency. Considering the bronchial tubes as excretory ducts, we must admit that of all the viscera, the lungs have the most extensive apparatus for excretion, whether we consider it in a vital or mechanical point of view. From the first, the products of irritation are got rid of by expectoration, and even in the suppurative stage, the accumulation of the matter is prevented by the universal permeability of the lung.

But the rarity of pneumonic abscess has been overrated. I have no doubt of the accuracy of Laennec's observations on this subject, and although in almost all his cases the evidence rests on physical signs, yet I would be sorry to believe that he had been "*deceived by auscultation*;" this I say from the confidence which experience has given me in Laennec's signs of pulmonary suppuration, signs always valuable, but nearly infallible, when as in most cases they succeed physical indications of the earlier stages, which precede the formation of abscess. I have now witnessed several cases in which this succession of physical signs was observed, and the disease traced from its earlier stages to the formation of abscess; and though even an experienced stethoscopist might err, as to the signs of a cavity in a case seen for the first time, it becomes next to impossible that the error could be committed when the physical signs have coincided with the successive stages of the disease. The actually existing phenomena derived a great value from those which have proceeded them.

I have observed pneumonic abscess under various circumstances; it more frequently occurs in the lower, than in the upper lobes; it may be the result of a localized phlegmonous inflammation, or of that extensive, but complete solidification already described. To this subject I shall return when speaking of the secondary pneumonia, and here only observe, that in the diffuse erysipelatous inflammations, abscess of the lung has frequently occurred in Dublin. Lastly, I possess anatomical evidence of its cure by cicatrization, of which the following case is an example:

A young man of strong habit was admitted into hospital for a pulmonary affection of some weeks' standing. The antero-superior region of the right side sounded dull, and in this situation, and likewise over the shoulder, all the signs of an extensive cavity were observable; over the rest of the thorax, signs of bronchitis existed.

In a short time the patient regained his looks, health, and strength, the pulse became natural, his appetite was restored, and he left the hospital declaring himself perfectly well, although all the signs of abscess continued unchanged.

After a few weeks he returned to the hospital, the signs of the abscess remaining as before; after some days he was again discharged, and resumed his occupation of a smith. We then lost sight of him for a twelvemonth, when he was again admitted, labouring under severe pleuropneumony, which had been neglected, and was of five days' standing. It appeared that after his last dismissal, he had enjoyed the most perfect health, although toiling at his laborious occupation, until five days before admission, when he was seized with pain of the side, cough, dyspnœa, and fever; he continued to work until his sufferings obliged him to desist.

He then presented all the symptoms of the fourth stage of pleuropneumony of the right lung. On percussion, the whole of this side, both anteriorly and posteriorly, sounded completely dull, except in the subclavicular region, where it was comparatively clear. This it will be recollected was the former seat of the abscess. Over the dull portion, bronchial respiration mixed with an intense muco-crepitating rale was audible, but on examining the sub-clavicular region, we found to our great surprise, that all the phenomena of a cavity had disappeared, *and were replaced by a puerile respiration.*

Here was a case full of difficulty. It was plain that the greater portion of the lung was solidified, and had passed into the fourth stage, but why a small portion of it should have escaped the disease when the rest was so far advanced, and that this portion should be that formerly occupied by an abscess, was indeed difficult of explanation.

All treatment proved inefficacious, and the patient sunk on the third day, the stethoscopic phenomena having continued unaltered.

On dissection we found the right lung solid over the whole extent indicated by the stethoscope. From the fourth rib downwards, the pleura was covered with coagulable lymph, which being removed, allowed us to see the lung, of a yellow colour, through the serous membrane. In the superior portion the adhesions were evidently old, as considerable force was required for their separation. On the summit and antero-superior surface, a deep puckering existed.

The lung was then divided, in a line corresponding to the angles of the ribs, so as to separate it into two portions, connected only at the root of the lung. This gave us at once an explanation of the physical signs. The supero-anterior portion, for a space of three square inches, was perfectly crepitating, and not all engorged. This was separated from the rest of the organ by the cicatrix of the abscess. The cavity had been obliterated by adhesions of its walls, so as to form a cartilaginous septum, superiorly half an inch in thickness, and inferiorly diminishing to about two lines; the whole length of this septum was about three inches; it commenced at the summit of the lung, running from behind forwards and downwards, and terminated where the large bronchus gives off its branch to the upper lobe; this septum throughout its whole extent consisted of two layers, connected only by some fine cellular membrane, and easily separable.

It was obviously the cicatrix of the abscess; from its situation it had isolated the subclavicular portion of the lung, or that in which puerile respiration was audible. A bronchial tube passed from the larger trunks, immediately below the cicatrix, so as to admit air into this portion of the lung, which differed in no respect from healthy lung, except that the interlobular septa were remarkably hypertrophied. The remainder of the upper, with the middle and inferior lobes, were solid, of a yellowish gray colour, and infiltrated with pus. The most careful examination failed to detect tubercle in any part of the system.

That this abscess was really the result of phlegmonous inflammation, there can be little doubt. The absence of the symptoms of phthisis in the first attack; the formation of the cavity, after but a few weeks' illness; the perfect recovery of the patient, all combine to establish its nature; and if additional evidence was wanting, the absence of a trace of tubercle in any part of the body, is sufficient to shew that the cavity was not phthisical.

I have given this case at length, as no instance of the cicatrization of a pneumonic abscess is recorded, and as its diagnosis is so full of interest.

Without reference to those purulent collections in the lung which result from venous absorption, I have seen acute pneumonic abscess under three forms. In the first, the abscess is encysted, and has all the characters of true phlegmon. In the next we find purulent cavities, communicating with the tubes, but without any cyst; the walls of the abscess being formed of the solidified lung. This form is seen in the secondary or erysipelatous pneumonia, and I have observed its formation by the stethoscope, and verified the diagnosis.

But in the third form which I first described, and of which a case is given in the chapter on bronchitis, the anatomical characters are peculiar. The pulmonary tissue is separated from the pleura, and the lobules dissected, so as to shew the structure of the lung. The lung lies bathed in pus, and we have an abscess under the pleura, but external to the lung.

Although in most cases of pneumonic abscess, the disease is referrible to acute irritation, yet we may find abscesses of a chronic character, which are not tuberculous. I have seen this disease under two circumstances. In the first an abdominal abscess had opened into the lung; and a long pear-shaped cavity surrounded by lung, solidified and infiltrated with pus, passed from the diaphragmatic surface, and opened into the large tubes. No tubercle whatever existed, and the lung was otherwise healthy.

But in the second case no such complication exists, and the disease is purely pulmonary. An abscess sometimes of considerable size occupies the lower portion of the lung; its walls are firm, and of an iron-gray colour, and the surrounding lung is in the state of chronic induration. We have now seen several of such cases; the patients did not present the usual symptoms of phthisis, the pulse was slow, and the breathing easy; there was little or no cough, and an absence of fever; indeed with the exception of emaciation, and a certain hectic appearance, there were no evidences of constitutional disease. On the upper portions of the chest, both the passive and active auscultatory signs were natural; but the lower lobe of one lung, (generally the right) presented complete dulness and absence of vesicular murmur, and gave all the signs of a cavity with free bronchial communication.

It is, however, yet to be determined, whether in these cases the abscess originated in an acute pneumonia, or was the result of a more chronic process.*

Connected with the pathology of pneumonia, we may examine its seat and resolution.

Seat of Pneumonia.—From the combined observations of Andral, Chomel, and Lombard, Dr. Forbes has shewn, that out of a total of 1131 cases, the right lung was engaged in 562, the left in 333, and in 236 the disease was double; the general result of which would be, that out of every ten cases, five would be of the right, three of the left, and two double. This result is probably near the truth, and corresponds pretty closely with my experience; but it will be found that the double pneumonia is more frequent than appears from the above statement. It commonly happens, that notwithstanding a great preponderance of disease in one lung, a careful physical examination will detect more or less of it in the other, even though no local pain or distress exist, which could lead to its detection.

Under these circumstances, the first effect of any general treatment will be seen on the lung least engaged.

A long experience leads me to conclude, that when we connect the seat and character of pneumonia, we find that the disease in the right lung is more often of the sthenic, and that of the left of the typhoid character. Either lung may present both forms of disease; but in the typhoid pneumonia, the left is most often the seat of the lesion. When discussing the secondary pneumonia, I shall return to this point.

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* The occurrence of chronic abscess of the lung has been noticed by Laennec, as we see in his observations on chronic pneumonia.

Although pneumonia commences in the lower lobes, in a much greater proportion than in the upper, we may often see the disease under the latter circumstances; and it is a curious fact, that we have observed an epidemic tendency to pneumonia of the upper lobes. Thus during the summer of 1833, a great number of cases of this description occurred in the Meath Hospital. The disease was in almost all cases of the typhoid character, and in the adult male subject.* I have seen it however in females, and not unfrequently in children, in whom it is often mistaken for phthisis.†

Resolution of Pneumonia.—It is now established, that resolution may take place at any stage of this disease; but the periods at which this change begins and is perfected, are exceedingly various. Thus the signs of complete dulness and absence of vesicular murmur may disappear within twenty-four or thirty-six hours; while in other cases many weeks elapse before the lung is restored to a natural condition.

Among the many singular results of auscultation there is none more remarkable than the discovery of the rapid changes which the lung undergoes in certain cases of pneumonia. I have frequently seen all the signs of solidification subside within two days, and have even observed great modifications in the course of a few hours. On this subject more extensive observation is wanting. I have found out of twenty-four cases in which the period of resolution, or in other words, the time in which all physical signs of disease had disappeared, was accurately observed, that in nine it occurred within the first week of the disease; in nine within the fortnight; in five within three weeks; and in one in a month from the period of invasion. In eighteen of these cases hepatization had occurred, and in one there was abscess, the signs of which disappeared in fourteen days. Lastly, I may add that my researches do not shew any difference in the rapidity of resolution comparing the disease of the right or left lung.

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* An intelligent American physician, who visited Dublin about that time, stated to me that a similar tendency to pneumonia of the upper lobes had been observed in some of the cities of the United States, and also in Paris, during the same year.

† In eighty cases of pneumonia, Andral found fifty-seven of the lower lobe, thirty of the upper, and eleven in which the whole lung was engaged. I think this proportion much greater than what occurs in this country.

SYMPTOMS OF PNEUMONIA.—So various are the circumstances under which we meet with this disease, that it becomes difficult to give any condensed account of its symptoms; and although we may enumerate fever, arterial excitement, cough, viscid, bloody, or purulent expectoration, dyspnœa and accelerated breathing, as its symptoms, still there is not one of these that may not occur in other diseases, or be absent in pneumonia itself. Further, we know that in most cases inflammation of the serous and mucous tissues complicates that of the parenchyma, so as to make it difficult to say what are the symptoms of pneumonia simply considered.

But the true source of diagnosis, is our finding the combination of irritation of the respiratory system, with the physical signs of pneumonia; of which signs it may be said, that although taken singly, any of them may occur in other affections; yet that in pneumonia, their mode of succession is quite characteristic.

But before entering on the physical signs, I shall observe shortly on the symptoms of expectoration and dyspnœa.

Although the sanguinolent and viscid character of the expectorated mucus is observed in many cases of pneumonia, yet it is any thing but constant. In fact pneumonia may occur with all varieties of expectoration, from a scanty and colourless mucus, to the most different characters of secretion. It often occurs without any characteristic expectoration, and may thus pass even to its advanced stages. Generally speaking it may be said that the "*crachats rouilles*" of the French, are found in the more active cases of pneumonia, which occur in robust habits; but I am convinced that in a large proportion of the hospital cases, in which the disease occurs in feeble constitutions; in the child, or as a complication or a sequel to fever, the appearance of the expectoration has little value. It is believed that the red and viscid sputa occur only at the height of the disease. This is generally true, but an exception to the rule has been recorded by Andral, in which for eight or nine day after the subsidence of the symptoms and signs of pneumonia, the sputa continued red, and extremely viscid. He suggests, whether in this case there might not have been a central pneumonia, which could not be detected, and which kept up the secretion. Such an opinion seems improbable from the disappearance of constitutional symptoms. I have seen a case similar to this, which illustrates how little value can be placed on a particular symptom. A woman was admitted into the Meath Hospital for an injury of the chest; several ribs had been broken. She was attacked with intense pleuro-pneumony accompanied by the red and viscid expectoration in quantity. All the physical signs of pneumonia supervened, and in a short time the lung was extensively hepatized. Under a most active treatment, however, the symptoms disappeared, with the exception of the expectoration. The dulness ceased, and the vesicular murmur was restored, but for weeks she had an expectoration of red mucus, presenting all the characters which it had in the first stages, and so abundant that on some days several pints were evacuated. Its tenacity was so great, that a dressing tray in which she expectorated, of twelve inches in breadth, and not more than two in depth, could, when full, be inverted without a drop escaping; yet repeated examinations discovered nothing more than the ordinary signs of bronchitis.

But in the suppurative stages the expectoration is generally characteristic; it then occurs under two forms, in the one we observe a purplish red muco-puriform fluid, while in the other we find that the matter coughed up has all the characters of the laudable pus of authors. It is of a light yellow colour, perfectly homogeneous, and of the consistence of cream. I have never seen this expectoration unless in the suppurative pneumonia, and it forms almost the only instance in which an expectoration of pure pus is met with.

As far as we have observed there is no anatomical difference between the cases with prune juice sputa, and those in which there is a secretion of healthy pus; but it will often be found, that in the former case the disease exists in a lower type, and in broken down constitutions, while I have never seen the latter except in cases of active pneumonia in the young and robust individual.

Either of these forms, but particularly the latter, are characteristic of the fourth stage of the disease, a condition which seems more often attended with a peculiar expectoration than any of the preceding stages. With reference to pulmonary abscess, I have only to remark, that in most of the cases I have seen the expectoration was not by any means characteristic. In two cases nothing was coughed up but a little bronchial mucus, while in the others it had very different characters. I have found it fœtid, or devoid of smell, mucous or muco-puriform, collected into masses which floated in serum, or resembling the ordinary expectoration of chronic bronchitis.

As a symptom of pulmonary irritation, dyspnœa is much more prominent in bronchitis or pleurisy, than in pneumonia. Indeed the respiration in this affection, particularly after antiphlogistic measures have been employed, is in most cases singularly easy, even though a large portion of lung has become hepatized, so that the amount of obstruction cannot be measured by the degree of dyspnœa.

In localized pneumonia two causes exist for dyspnœa with accelerated breathing, namely, its complication with extensive bronchitis; and that inflammatory excitement which affects the whole lung. Many cases will be met with in which both conditions exist; but the second may occur independently of the first.

Hence there are three cases in which the difficulty and acceleration of breathing are no measure of the extent of pneumonic disease. In the first there is an extensive bronchitis; in the next, the combination of this with the functional excitement of the lung; and in the third, this condition exists with scarcely any bronchial irritation. From ignorance of these facts we may commit great errors in practice; for in all these cases the first effect of treatment is seen less on the pneumonia, than on these accompanying states; on the bronchitis, on the one hand, and on the inflammatory spasm or excitement on the other.

Physical Signs of Pneumonia.—The sources of physical signs in this disease may be thus enumerated:

1st. Evidences of a local excitation.

2nd. Evidences of sanguineous congestion.

3rd. Evidences of the diminished quantity of air in the affected lung.

4th. Signs of increasing solidity of the lung.

5th. Phenomena of voice.

6th. Phenomena referrible to the circulating system.

7th. Evidence of accompanying lesions of the pleura.

8th. The diminished volume of the lung.

In the above catalogue, no mention is made of *the signs of accumulation* or visceral displacement, so valuable in other diseases. These signs are wanting in pneumonia, for although the observation of Broussais, as to the impression of the ribs on the inflamed lung, may be often verified, yet the increase of volume goes no farther. The appearance is not constant, and I have only observed it in cases where the whole lung had passed into interstitial suppuration. These depressions are seldom more than three lines in depth, and hence, though their existence shews that some tumefaction has occurred, it is plain that it cannot interfere with diagnosis, and make us confound a solid lung with a distended pleura; so far we may agree with

Laennec, but his denial that any tumefaction occurs in pneumonia is not borne out by observation.*

Signs of the first Stage.—The physical signs of the first stage of pneumonia are still to be determined with accuracy. Without possessing a sufficient number of observations to determine the point, I am led to the belief that an *intense puerility of respiration in the affected part* will be found to be the principal phenomenon. In cases in which inflammation was spreading upwards, I have often found that a puerile respiration preceded the crepitating rale for some hours: and that this was not a general but a partial condition was shewn by its being much more intense in the vicinity of the disease than in the opposite lung. Indeed in cases presenting great puerility of respiration with fever, we may often prognosticate the occurrence of the crepitating râle. Thus in a case in which numerous inflammations successively occurred, and in which the disease attacked both lungs as well as the pericardium, I observed this sudden appearance of intensely puerile respiration on three distinct occasions; in two it was followed by the crepitating rale, and other signs of pneumonia, and in one was removed by bleeding before the above signs had occurred.

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* See Dr. Forbes's translation, page 185. It is difficult to explain how Laennec should have taken up his opinion so strongly on this subject, for the appearance is by no means unfrequent, and we should expect it from all the analogies of disease. In all my cases, the pleura had been inflamed, and the marks of the ribs produced by two causes, one the depression in the lung, and the other *the less degree of organization which the lymph corresponding to each rib had undergone.* Thus we have an alternation of comparatively transparent and opake spaces, as if the contact with the rib was less favourable to organization than that with the intercostal muscles. Looking at the analogies of disease, it appears that if we examine the influence of inflammation in altering the volume of organs, we find that tumefaction is commonly observable in the earlier stages. In the chronic irritations, on the contrary, although an hypertrophy sometimes results, yet *diminution of volume* is more frequently met with; and in the same case the affected organ may first exceed, and afterwards be reduced far below its natural dimensions. This occurs in the lung; inflammation produces a tumefaction and afterwards an atrophy of the organ, which we can verify by measurement of the chest.

From these and many other observations, I would conclude that we may diagnosticate the first stage of pneumonia by the sudden occurrence of a local puerility of respiration, combined with fever and excitement of the respiratory system.

The circumstances which give value to this phenomenon, as a sign of pneumonia, are obviously its sudden appearance, localization, and combination with fever.

SIGNS OF THE SECOND STAGE.—The crepitating rale, and the gradually diminishing vesicular murmur constitute the signs of this stage, and it is the combination of these phenomena which gives them their value. It must be admitted that Laennec has not succeeded in establishing the crepitating rale as an invariable phenomenon in this disease. It is neither invariable nor positive, but like all other physical signs, derives its value from the preceding and accompanying phenomena. As a physical sign, it only points out a secretion or effusion into the pulmonary cells, and to determine that this is pneumonic, we require the increasing dulness and gradual obliteration of the respiratory murmur.*

Laennec has stated, that the resolution of solidity is invariably announced by a return of the crepitating rale, (*ronchus crepitans redux*,) but my experience is altogether opposed to this statement, for I have often observed the change from complete dulness of sound and bronchial respiration, to clearness and return of respiratory murmur, without any crepitus of resolution; and this may be seen in all varieties of pneumonia; nor does the absence of the phenomenon necessarily imply a rapid resolution, for it may be absent in cases in which weeks elapse before the dulness of sound is removed. But the sign is common where the disease has passed into an advanced stage, where early treatment has been neglected, or the vital powers much depressed.

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* The crepitating rale has been compared to various sounds; of these comparisons, that by Dr. Williams is most accurate, namely, the sound produced by rubbing a lock of hair close to the ear. This may be observed both in the commencement and resolution of the disease; but all varieties of crepitating and muco-crepitating rales may occur in pneumonia.

The crepitus of resolution (generally having much larger bubbles than in the earlier stages) is to be heard during the whole inspiration, and in a diminished degree during expiration. But in other cases the first part of the inspiration is pure, and the rale only appears at the termination of the effort.* In one case, however, I have observed the reverse of this, for we had first rale, and then pure vesicular murmur.

SIGNS OF THE THIRD STAGE.—In this condition, the cells being obliterated, while the large tubes remain pervious, dulness of sound, bronchial respiration, and a loud resonance of the voice are produced, and *within certain limits,* the extension or intensity of these signs furnish an accurate measure of the extent or intensity of the disease. With respect to the bronchial respiration, there are some circumstances not generally understood; it requires for its production not merely the solidity of the lung, but a certain expansion of the side during respiration. Thus we find that if the whole lung become solid, the bronchial respiration ceases, the side is fixed, an evident result of the non-expansion of the lung. In such a case the phenomenon goes on increasing to a certain point, after which its diminution points out the extension of the disease, until the whole lung is solidified, when the signs are universal dulness, absence of respiration, and resonance of the voice. If now the upper portion begins to resolve, or if an abscess be formed, in either of which cases air again rushes through the bronchial tubes, we have a return, and for some time an increase of the bronchial respiration, indicative of resolution on the one hand, or abscess on the other. These phenomena I have repeatedly verified, and have observed that for the reproduction of the bronchial respiration it is not necessary that the permeable portion should be of great extent. Thus in the case of cicatrized pneumonic abscess which I have given, the permeable portion did not form a sixth of the whole lung, and was yet sufficient to induce bronchial respiration in the solidified parts.

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* Some have conceived that the crepitating rale arose from the effusion of air into the substance of the lung; the phenomenon just mentioned is a strong argument against this opinion.

In cases where the lung is universally solidified, the disease might be confounded with an extensive empyema, particularly if the previous history and succession of physical signs were not observed: but even here the diagnosis can be made, for I have never seen a case of empyema so extensive as to cause *general dulness*, in which there were not the signs of visceral displacement, which, with the absence of the phenomena of voice, are quite sufficient to guide the diagnosis.

In the ordinary pneumonia, the dulness of sound and bronchial respiration are preceded by the crepitating rale, but I have already spoken of a most important variety, in which *a rapid solidification occurs, not preceded by the usual signs*. Under these circumstances, the lung may pass in the course of a few hours from apparent health to complete solidification. The disease begins by hepatization, and often runs its course with great rapidity, and it requires some diagnostic skill to distinguish this case from pleurisy with copious effusion. This fact, so important an exception to Andral's rule, that sudden dulness without crepitus is pathognomonic of pleurisy with effusion, I was aware of, and taught in my lectures many years ago, and my observations have been since confirmed by Dr. Hudson.

The principal physical diagnosis between this typhoid solidity and a pleural effusion is, that with the dulness and absence of respiration of a *great effusion*, the signs of eccentric displacement are wanting; the heart is not displaced, the epigastrium and hypochondria are concave, and the intercostal muscles unaffected. But we can be assisted by other points; the phenomena of voice, the greater frequency of bronchial respiration, the occasional occurrence of rale here and there will assist in the diagnosis, the grand source of which, however, consists in the application of the first rule which I have given in a case presenting the symptoms of typhoid pneumonia.

SIGNS OF THE FOURTH AND FIFTH STAGES.—In the first of these conditions we find a combination of phenomena which is almost peculiar, I allude to that of bronchial respiration, with a sharp and peculiar muco-crepitating rale; phenomena, which, when taken in connexion with the previous history and actual symptoms, leave no doubt as to the nature of the disease. Out of many hundred cases of resolution, I have never witnessed this combination of signs, but should any doubt exist, it can be removed by examining the remainder of the lung, in which, if we find the *signs of extension of disease*, we may rest satisfied that the muco-crepitating rale is the result of the suppuration of the lung.

On the signs of pneumonic abscess I have nothing of importance to offer. As they do not differ from those of tuberculous caverns, the diagnosis is to be drawn first from their situation, which is generally at the inferior portion or about the root of the lung, and secondly and more especially from their history. The formation of a tuberculous is a much slower process than that of a pneumonic abscess, it is not preceded by the pneumonic signs, and in many cases, at least, is not accompanied with that extent of dulness so remarkable in pneumonia.

If we compare the phlegmonous abscesses with those occurring in the typhoid or erysipelatous pneumonia, we find that the latter are formed with much greater rapidity. This is characteristic of the disease in general.*

In the case of dissecting abscess, where the lobules were separated from the pleura,* the symptoms indicated suppuration, but the proper signs of a cavern were absent. In M. Louis's case, as given by Reynaud, no diagnosis was recorded, so that the indications of this form are still to be determined.

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* In these cases, the abscess, as I have already remarked, frequently becomes gangrenous. I have known the expectoration and breath to become fœtid within forty-eight hours after the appearance of the stethoscopic signs.

Observations are wanting on the stethoscopic signs of cicatrization; the case which I have given is the only one on record where this change was verified. It will be recollected, that the signs were the total disappearance of cavernous phenomena, and a substitution of the natural vesicular murmur.

Having now examined the signs of the several stages of pneumonia, we may proceed to consider certain phenomena which may arise at any period of the disease.

Phenomena of Voice.—These signs, which are of comparatively little value, are most evident when dulness of sound and bronchial respiration co-exist. We have then Laennec's accidental broncophony, always most evident in the posterior and superior portions. It is easily distinguished from pectoriloquism, by its greater extent, and by the absence of gurgling or cavernous respiration. I have found its character to be remarkably modified under two circumstances, when it approaches to the egophony of pleuritis; these are, when the lung has passed into the fourth stage, or when it is resolving from the third. In the latter case, indeed, the egophonic character is sometimes very remarkable.

Phenomena referrible to the Circulating System.—Our knowledge on this subject is as yet very limited. Two phenomena, however, have been described, which must be here mentioned, namely, the occurrence of a bellows' sound in the heart during pneumonia, and the throbbing of a large portion of the chest, synchronous with the heart, pending the earlier stage of disease. Both these circumstances occurred in a case of acute pneumonia recorded by Dr. Graves. The bellows' sound was distinct, not merely in the region of the heart, but over the front of the chest. It did not exist in the subclavian or carotid arteries, and continued without any abatement for several days, subsiding with the inflammation. As Dr. Graves has left to others the explanation of this phenomenon, I may state my opinion that the heart was probably inflamed, either in the forms of pericarditis or the endocarditis of Bouillaud, in either of which a bellows' sound may occur, and the complication with pneumonia may have caused the latency of the carditis.

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* The "plastic croup" of Reynaud. See my case under the head of Bronchitis, page 143.

In the same case it was found that each pulsation of the heart was felt all over the front of the right lung, and this occurring when the lung was not hepatized, renders Laennec's explanation unsatisfactory. Dr. Graves observes, that if the pulsation was propagated through a solid body, its strength at any one point would be weakened in proportion to the size of that body, and further, that in this case the impulse was not lateral, but diastolic, so as to simulate an aneurismal pulsation. "In the soft, engorged, and semifluid state," to use the words of Dr. Graves, "it is easy to conceive why the lung, connected with the heart by such vast vessels, should pulsate with a strength almost equal to that of aneurism; the brain pulsates notably at each stroke of the heart, and cerebriform and fungoid tumours on the surface of the limbs and body have, for this very reason, occasionally a pulsation so strong and distinct, as at times to have deceived the surgeon into the belief of their being aneurismal."

Owing to the kindness of Mr. Carmichael, I have seen a case which corroborates the opinion of Dr. Graves; a large cerebriform tumour had sprung from the posterior mediastinum, and displaced the upper lobe of the left lung. During life, the corresponding portion of the thorax, though presenting no external tumour, gave so distinct and eccentric a pulsation, as to leave little doubt on my mind as to the existence of an aneurism; this opinion was strengthened by other circumstances, which shall be hereafter detailed. On dissection, it was found that the disease engaged the root of the lung, and surrounded the left division of the pulmonary artery, the pulsations of which were thus transmitted over the entire tumour.*

From these observations we may infer, that in a semi-fluid condition of the lungs, the pulsations of the heart may be propagated through these organs, and cause phenomena analogous to those of aneurism.

PHENOMENA REFERRIBLE TO THE PLEURA.—In this disease there are three conditions of the pleura which produce physical signs; these are the effusions of lymph; of sero-purulent fluid; and lastly, the effusion of air. I have arranged these in the order of their frequency; the first is almost constant, the next is comparatively rare, and out of many hundred cases, I have only seen one example of the third.

The occurrence of lymph on the pleura does not necessarily induce corresponding physical signs; hence the *frottement* of Laennec is not a common sign of pneumonia, and is rarely observed in the advanced stages, or at the resolution of the disease. I have never found it after the lung had become solid. In a few cases, however, of acute and extensive pleuro-pneumonia in the earlier stages, I have observed it over a large surface. In a case where both lungs and the heart were engaged, *frottement* existed in the pericardium, as well as in both pleuræ. For some time the belly was tympanitic, which gave to the rubbing sounds a completely metallic character, constituting the most singular modification of a stethoscopic phenomenon which I have ever had occasion to observe. But this was a rare case, for even where pain in the side occurs, *frottement* is commonly absent. Is this owing to the diminished motion of the inflamed lung, or to the rapid obliteration of the cavity, by that mode of almost direct adhesion, in which little or no lymph is effused? The absence of *frottement* during resolution is in favour of this supposition.

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* In some cases of this nature, says Dr. Graves, the action of the heart is sufficient to induce pulsation and throbbing, not merely in the inflamed lung, with which it is directly connected by means of enlarged vessels, but also in the superficial veins of the extremities, an occurrence proving the correctness of the explanation of pulmonary throbbing which I have given. Thus, in the case of a gentleman labouring under pneumonia, attended by Mr. M. Collis and myself, the action of the heart was very powerful, and a distinct pulsation, corresponding to each stroke of the left ventricle, was perceptible in all the veins of the back of the hand.—*Op. cit.* p. 54.

As the combination of pneumonia with liquid effusion presents some interesting points connected with the diagnosis of empyema, I shall return to it when considering that subject.

But of all these signs, the most remarkable is the tympanitic clearness over the diseased lung, a phenomenon evidently proceeding from an effusion of air by secretion into the serous cavity. The first writer who has noticed this subject is Dr. Graves, who published early in 1835 the remarkable case to which I before alluded, of pneumonia with bruit de soufflet and throbbing of the chest. On the fourth day of the disease, after hepatization had occurred, the antero-superior portion of the affected side gave a preternaturally clear and hollow sound, and as no respiration whatever could be heard in this region, he concluded that the lung was here pushed back, and compressed by an effusion of air. In the course of sixteen hours, the region which presented this singular sign had become as dull as possible, and a feeble murmur, with some crepitus could be then heard. The patient ultimately recovered.

When I speak of pneumo-thorax, I shall return to this subject, and here merely allude to it in connexion with pneumonia. Dr. Graves has described a case of pneumonia in a child, in which the heart was dislocated to the right side, without any evidence of liquid effusion into the left pleura; over the cardiac region, on the contrary, a morbidly clear sound existed, as if an effusion of air had displaced the heart. The patient recovered, but the heart had returned to its natural situation many days previous to the resolution of the pneumonia.

Subsequently to the publication of Dr. Graves's papers, Dr. Hudson, in an admirable memoir on typhoid pneumonia,* has given four cases, in which, according to him, this phenomenon existed. As two of these occurred in the Meath Hospital, the patients being, in fact, under my own care, I must observe that in neither of them, in my opinion, did the sign in question exist. In the first case, the tympanitic resonance proceeded obviously from the stomach, while the second was an example of solidified lung, with mucus in the tubes, giving the *bruit de pot fele*. Dr. Hudson states that the other two cases which he observed in his own hospital were similar to the first which I have noticed. If this be so, I can only say, that I quite agree with him as to the absence of air in his cases.

The first of Dr. Hudson's cases was an example of violent and universal pneumonia of the left lung; the patient died in the Meath Hospital, with symptoms of inflammation of the brain. On this case Dr. H. remarks, "that from the hollow sound on percussion of the lower part of the left side, previously quite dull, a pretty general opinion existed, that pneumonic abscess had formed, and burst into the pleura; the side was punctured accordingly, but no air escaped, and further dissection shewed the pleura adherent to two-thirds of the lung, red and solid, but no abscess. The next was a man who presented himself at the same hospital with the history and symptoms of phthisis, and on percussion under the right clavicle, there was such a remarkable muffled tympanitic sound, with tracheal respiration and resonance of voice, that all who heard these phenomena expected to find a large tuberculous cavity, dissection, however, shewed the lung hard and solid throughout from chronic pneumonia." In these observations, I regret that my friend Dr. Hudson did not state, that the diagnosis as to the existence of abscess, fistula, and pneumo-thorax in the first case, was not made by me, and that I did not expect to find a tuberculous cavity in the second; the opinions alluded to existed only among some members of the class of the hospital.

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* Dublin Journal of Medical Science, vol. vii.

I have only once observed this phenomenon: a female, long addicted to the use of ardent spirits, was attacked with a severe typhoid pneumonia, in which the lung ran rapidly into hepatization. On the eighth or ninth day of the disease, the antero-superior portion of the left side, where, on the day previously, there had been a complete dulness, gave a clear, sonorous, tympanitic sound, similar to what is produced by the stomach in the highest degree of flatulent distention; this extended from the clavicle to the cardiac region; immediately under the clavicle a slight murmur was audible, while about the eighth rib the pulmonary friction sound could be heard. On the next day the tympanitic clearness had extended to the postero-superior portion of the chest, but on the day following, all had subsided, and the chest was again dull, with absence of vesicular murmur.

This patient recovered, but as is usual in the typhoid pneumonia, her convalescence was extremely slow: the lung continued long hepatized, and an irregular hectic existed. The disease took five months to run through its course, but the recovery was ultimately perfect.

This case is decisive as to the question, how far the tympanitic resonance in pneumonia is to be referred to a distended stomach: that such was not the case here is evident, for the sound only existed in the upper portions, and the region of the stomach was never tympanitic. We had further physical signs of irritation of the pleura, in the continuation for two days, of the friction sound, audible below the effusion of air.

It is not, however, to be denied, that when the lower lobe of the left lung becomes solidified from any cause, an accumulation of air in the stomach will produce a characteristic change in the sound on percussion, varying with the amount, and subsiding with the disappearance of the air; but this sound is altogether different from that of pneumo-thorax in pneumonia. I might say, and stethoscopists will appreciate the distinction, that the one is a tympanitic dulness, the other a tympanitic clearness.

I have known some instances in which this clearness from a distended stomach was mistaken for the natural sound; such an error can only happen to very inexperienced stethoscopists; the clearness and distention of the region of the stomach, the bronchial respiration, the voice, will, independent of the character of the sound, suffice to prevent the error.

SIGNS REFERRIBLE TO THE DIMINISHED VOLUME OF THE LUNG. We have already seen that between pneumonia and empyema there was this difference, that the signs of accumulation did not occur in the first disease. In most cases of empyema the side is enlarged, but the increase of volume, which occurs in pneumonia, is not to be appreciated during life.

But in the advanced stages of these diseases, a curious similarity in physical signs may be observed: the contraction of the chest after the cure of empyema has been long known, but it is not generally understood, that the same circumstance may occur in chronic pneumonia; the analogies of disease would lead us to anticipate this result, but I am not aware that the fact has been noticed by any writer. We may observe it in cases where the lung has been long indurated, and still continuing impervious, and it may even co-exist with a gradual, and ultimately perfect resolution of disease. I have observed this, particularly in a case of asthenic pneumonia, which was under my daily observation for nearly three months, and in which the contraction was as great as in any case of empyema that I have seen. In this case there was not the slightest appearance of liquid effusion into the cavity of the pleura, and the only difference between the contraction here, and that of empyema, was, that it seemed to affect the whole side more than what is generally found in pleurisy.

In other cases, however, the contraction is very similar to that of empyema: it occurs in the lower portion, the ribs are approximated, the angle of the scapula, as it were, tilted out, and the sound on percussion comparatively dull, with feeble respiratory murmur. In all cases of this contraction which I have observed, the primary disease had been of the typhoid character, and the contraction seemed to result from that slowness of resolution, so remarkable in this affection:—

Recapitulation.—1st. That the signs of accumulation are not available in the diagnosis of pneumonia.

2nd. That in the first stage, the physical signs seem often to be, puerility of respiration, with clearness of sound on percussion.

3rd. That the puerile respiration precedes the crepitating rale, but may be removed by treatment, before the above sign has occurred.

4th. That in the second stage, (Laennec's first,) the signs are, the crepitating rale, the gradually diminishing murmur, and the comparative dulness of sound.

5th. That the signs of the third stage may occur without being preceded by those of the second.

6th. That the bronchial respiration implies some expansion of the lung, or permeability of its cells.

7th. That the diminution of bronchial respiration may point out an increase of disease, while its increase may indicate returning permeability.

8th. That this return and increase of bronchial respiration may be produced either by local resolution, or by abscess, communicating with the bronchial tubes.

9th. That the absence of the signs of displacement of the heart, diaphragm, or intercostals, with the phenomena of voice, together with the previous history, are sufficient to distinguish between universal solidity and empyema.

10th. That in the fourth stage bronchial respiration is generally combined with a sharp muco-crepitating rale, and complete dulness of sound.

11th. That the signs of pneumonic abscess do not differ from those of pulmonary caverns in general.

12th. That the diagnosis between them and tuberculous cavities is to be drawn from their history, situation, and rapidity of formation.

13th. That the formation of pneumonic abscess is preceded and accompanied by more complete and extensive dulness of sound, than that of phthisical cavities.

14th. That the crepitus of resolution is not necessarily present in the subsidence of a pneumonia.

15th. That the disease may resolve, either in its acute or chronic form, without this phenomenon.

16th. That when it exists it may be combined with, preceded, or followed by the natural respiratory murmur.

17th. That the muco-crepitating rale in the fourth stage is to be distinguished from that of resolution, by its sharper and more viscid character, but principally by its combination with bronchial respiration, great dulness of sound, *and the signs of extension of disease in other parts of the lung.*

18th. That with respect to the circulating system, two remarkable signs have been observed, viz. a bellows' sound over the heart and anterior portion of the chest, and a throbbing of the lung analogous to that of aneurism.

19th. That the signs of pneumonia are modified by those of solid, fluid, or aeriform secretions into the cavity of the pleura.

20th. That notwithstanding the frequency of adhesions, the friction sound is rarely observed in pneumonia.

21st. That the secretion of air into the cavity of the pleura is pointed out by the sudden appearance of tympanitic resonance over the affected portion of the lung.

22nd. That this sound has an essentially different character from the *bruit de pot fele* of caverns, or of solidity, and that it also differs from the stomachal clearness.

23rd. That it appears and subsides in a sudden manner.

24th. That it may occur in conjunction with the friction sound.

25th. That under certain conditions the volume of the lung is diminished in pneumonia.

26th. That this may occur from recent pleuro-pneumonia, but is most remarkably seen in the slow resolution of the asthenic disease.

TYPHOID PNEUMONIA.

Under this head may be included a variety of cases in which, whether from the low state of the constitution, the complication with other local diseases, or, the pulmonary affection being secondary to a *general morbid condition,* we find a pneumonia often more or less latent, and accompanied by extreme prostration.

This disease, so frequent in Dublin, at times indeed, almost epidemic, has been long noticed under the names of the putrid, bilious, typhoid, or erysipelatous pneumonia, and various theories as to its nature have been successively formed and abandoned. All this arises from not recognizing the fact, that pneumonia may occur as a secondary affection in fever, or other morbid conditions of the whole system, and that its complication with one or more local inflammations elsewhere situated, may give it a typhoid character. We cannot say that there is any specific typhoid pneumonia; but we find that under a variety of depressing circumstances, conditions of the lung more or less analogous may be induced, presenting the characters of the disease as given by various authors.*

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* See Huxham on Fevers; Stoll, De Peripneumonia Vera; also Burserius, who has described an erysipelatous pneumonia. In the writings of Good, Williams, Mackintosh, and Andral, the disease is noticed. Louis merely alludes to the occurrence of hepatizations in typhous fever. Recherches sur la Gastro-Enterité.

This disease is seen more frequently in hospital than private practice, a fact strongly illustrative of its connexion with the low state of the system. I have observed it in the following cases:

1st. As a complication with enteritis, or gastro-enteritis.

2nd. Complicated with true typhus.

3rd. Occurring in cases of bad erysipelas.

4th. Supervening in cases of the diffuse cellular inflammation.

5th. Complicating the delirium tremens from excess.

6th. As a consequence of phlebitis.

7th. As apparently the sole disease.

Now although these cases must be considered different as to their original nature, yet with respect to the pneumonia, they have a certain agreement, for the affection is more or less latent, presents similar physical signs, and requires that the antiphlogistic treatment should be employed with extreme caution, and in many cases that the free and early use of stimulants should be resorted to. Of the cases above noticed, those complicating typhus fever are most frequently observed.

Under these circumstances, patients present the general indications of typhus, and frequently the signs of enteric irritation, with the physical indications of pneumonia. I say the physical indications, because the symptoms are often completely absent. A dusky hue of the face, and a trifling cough, with or without expectoration, slight dyspnœa, and acceleration of breathing, may occur; but the patient rarely complains of his chest, even though extensive and fatal disease may

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In the earlier editions of the Histoire des Phlegmasiès Chroniques, the statements of Broussais, written before he had formed his theory of fever, may be studied with great advantage. He recognized the secondary and complicated pneumonia of typhus, the latency of the disease, and its slow resolution. P. Frank has described several varieties of the disease; of these the *nervous peripneumony* seems most like the disease as met with here.

exist. This, indeed, is one of the diseases in which the practical utility of auscultation is most frequently seen; and again and again will the stethoscopist detect an inflammation of the lung, which has occurred without cough, pain, dyspnœa, or expectoration. The question, as to how far the existence of a typhoid character implies that the disease is secondary to typhus, or some other morbid state of the system, whether general or local, is still an open one. On this subject my experience is, that although in most cases we meet with the disease in its complicated forms, yet that it may occur as the sole affection: thus I have observed it more than once from contused injuries of the chest. I have seen many cases in which no symptoms whatever of enteritis existed, in which patients recovered under treatment directed solely to the chest; and though I have often found the ileum extensively ulcerated, yet this is not an essential characteristic of the disease, inasmuch as in other cases there was no appearance of gastro-enteritis in any form. These facts show that a complication with abdominal disease is not constant in this affection: and we must explain its characters on some other principle.

Nor does the actual complication with enteric inflammation necessarily imply a typhoid condition, for I have seen a well marked case of pneumonia with severe enteritis, in which the most active and repeated bleedings alone succeeded in reducing the disease.

In the case of complication with enteric disease, we find pneumonia either secondary to, or coeval with, the abdominal affection; of these, the first is the most frequent, but the character of comparative latency may be seen in both.*

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* There are two reasons why pneumonia of this character should be always more or less latent. First, the general law which regulates the latency of all inflammations occurring in that state of the system where fever and diminished nervous energy exist; and next, the circumstance of its being complicated with disease in other parts. The manifestation of inflammatory disease is always in pro-

As a complication in typhus fever, we may observe this disease in three forms. In the first, a bronchitis exists for several days, and passes ultimately into a pneumonia, the lower part of one side becoming gradually dull, with a humid crepitus. In the second variety, we observe no difference between the mode of invasion or physical signs, and those of the ordinary disease; while the third presents that sudden solidification which has been already described. Of these the second is by far the most manageable form.

In most cases, even where inflammation of the pleura has occurred, the patients feel no pain; the blood is often diffluent and dark coloured, like that in typhus, though occasionally presenting the buffy crust. Another point of resemblance among them is, that though the disease is generally formed with rapidity, its resolution, as compared with that of the sthenic pneumonia, is extremely slow: chronic hepatizations, with or without a low hectic fever, or a lurking congestion, may continue for many weeks. And although, under proper treatment, the disease may be ultimately eradicated, yet atrophy of the lung, with or without ulcerative disease, is often established.

But one of the most interesting and least appreciated forms of this disease, is that which occurs in delirium tremens. This complication seems essentially to belong to the delirium tremens from excess; I have never seen it in that from the want of stimulants. The disease commonly attacks the left lung, particularly in its lower portion, and is constantly overlooked. In many cases I have found that it was not the only local inflammation, but that a gastritis, and in some instances a low pericarditis, co-existed. I have no doubt that in many

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portion to its localization and simplicity. If there happen to be two or three inflammations going on at the same time, a kind of balance is established, and the symptoms of each are less apparent.

cases of delirium tremens the fatal result is owing to this complication of disease, but particularly to the pneumonia, which I have seen to produce suppuration of nearly the whole lung, when its existence was never even suspected.

In all these cases the patients had either been treated by stimulants from an early period of the disease, or which comes to the same thing, had continued indulging in spirits until a few days before death. And I have seen in such cases the stomach, heart, lung, and brain, simultaneously inflamed.*

These diseases are always more or less latent; a fact explicable by their mutual influence, and by the severity of the nervous symptoms.

The terminations of typhoid pneumonia are various, it may rapidly produce a fatal hepatization; it may form gangrenous abscess; or induce a chronic solidity of the lung, passing into the tubercular condition.

One of the most interesting circumstances to the practical physician is the extreme slowness of its resolution as compared with the sthenic pneumonia. Months may elapse before the respiratory murmur is restored, and in many cases this is never completely re-established. The fact already mentioned, that contraction of the chest has been only met with in these cases, shows the slowness with which the disease is removed. There is, however, one case in which, from conversion, a rapid subsidence of the pulmonary disease occurs. Thus I have seen the signs of pneumonia to subside in a single day on the occurrence of a gastritis or enteritis, and something of this kind may be suspected when there is a sudden and complete resolution of a typhoid pneumonia.

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* Although we cannot admit with Broussais, that delirium tremens is nothing but gastritis, yet the frequency of the latter in cases of excess is not to be denied. The other diseases too are analogous, and it remains to be proved whether they are coeval with the gastritis, or the result of sympathetic irritation.

TREATMENT OF PNEUMONIA.

I shall here consider the treatment of the simple inflammatory, and the typhoid pneumonia.

Treatment of the Sthenic Pneumonia.—Of all parenchymatous inflammations that of the lung seems most under the control of judicious treatment, if this be adopted at an early period; but if the disease be allowed to run on into its third or fourth stages, its treatment becomes much more difficult.

I find the bold and repeated use of the lancet to be unnecessary in the great majority of cases, and I am convinced that in general a single or at the most two bleedings will be sufficient. Out of many hundred cases I have had only one in which it was necessary to bleed more often than twice; in this instance there was a complication with hypertrophy of the heart. The true principle seems to be that general bleeding is to be considered only as a preparative for other treatment, and not the chief means of removing the disease. I have no doubt that too much has been said as to the necessity and advantage of large or repeated bleedings in pneumonia, and the mind of the young practitioner has been trained to consider them as his great resource, to the neglect of other necessary and important measures, and the consequence has been, that the cure is often purchased at too dear a price, or what is more frequent, that the disease is only modified, but not removed. It is changed from a manifest to a latent pneumonia, the cough, dyspnœa, pain, acceleration of bleeding, and fever are reduced, and the patient is considered as cured, while his lung remains solidified or even passing into other disorganization.

I am most anxious to press the importance of local bleeding in the treatment of pneumonia, for I consider it as the principal remedy. For this purpose either scarification or leeches may be employed; but, if the latter be used, I would, in all cases, recommend that the cupping-glasses should be employed in conjunction with them. In this way the general fever and arterial excitement having been previously reduced by the lancet, we may, directed by the stethoscope, continue day after day to detract blood from the affected part, while the patient's strength can be supported by food and even wine, if necessary. In the treatment of the typhoid form, the best practice is to use wine in conjunction with local bleedings.

Under this treatment, the bowels having been emptied and all exciting causes removed, the question will arise, whether the patient is to be treated upon the antimonial or mercurial plan. In deciding the relative merits of the two remedies, we have a difficulty *in limine*, from the absence of statistical information; in the want of this we must rest satisfied with those conclusions to which our every-day experience has led us. After ten years' hospital experience, I would state the rule which should guide us to be the following:—

That the success of the antimonial treatment depends on or is favoured by the inflammatory character of the fever, the early stage of the disease, the absence of complication with other diseases, the fact of the patient having borne bleeding well, and the firmness of the coagulum; the more the case presents these characters, the greater will be the likelihood of the tartar emetic acting favourably. But in the typhoid, secondary, and complicated cases, in those where the powers of life have been previously injured, where bleeding cannot be used with boldness, and where stimulants are required, the exhibition of the tartar emetic in full doses is very hazardous. The mercurial treatment is to be preferred from its greater safety, and in this disease, more than equal efficacy.

In the Meath Hospital we have used the tartar emetic after the manner of Laennec; but its exhibition has been conducted on a different principle; for while he considers it as his chief remedy, we have always found it secondary to general or local bleeding.*

It is while the crepitating rale is heard most distinctly, and before a complete solidification has taken place, that the remedy answers best. Indeed, in the advanced stages of the disease, and where the object is to remove an hepatization, the antimonial is inferior to the mercurial practice; but the mere occurrence of hepatization does not contra-indicate the use of the antimony, if it be in the early stage of the disease, *and while the crepitating rale is advancing in other portions of the lung.*

We generally begin with the use of from four to six grains on the first day. The dose is increased by one or two grains daily, until ten, twelve, or fifteen grains are exhibited in the twenty-four hours. I have never gone beyond this dose; but it must be remembered that the most careful attention was always paid to local treatment.

For the reduction of the ordinary inflammations of the lung in this country, our returns shew, that it is seldom necessary to administer more than from twenty-five to thirty grains of the remedy given in the doses above mentioned. In many cases, however, larger quantities have been employed: thus, I have often continued the exhibition of the remedy to the amount of fifty grains, and one case, where an acute double pneumonia was superadded to a chronic bronchitis, 170 grains were used at the doses of twelve grains daily. The patient's symptoms and appearance daily improved under its use, and during the latter period of its exhibition his appetite and digestive powers were excellent. In this case the recovery was perfect and permanent. In many cases the first doses produce vomiting, and in some purging; but the effects generally subside after the first twenty-four hours. With respect to the interval of tolerance,

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* The formula used is that already given in the chapter on Bronchitis.—See p. 112.

I have constantly verified the statements of Laennec,* and there is hardly a more interesting circumstance in medicine than to see a patient taking from eight to twelve grains of the remedy daily, without vomiting, purging, or sweating, without any effect, indeed, save the gradual removal of the pneumonia. This treatment is seldom followed by abdominal irritation. In one patient, after the use of eight grains daily for four days, violent vomiting, diarrhœa, and pain in the abdomen supervened. These symptoms subsided under a sedative treatment, but returned in two days with such violence that the lancet had to be employed. In another case the usual symptoms of poisoning with tartar emetic followed the first dose of the medicine ; both these patients recovered without difficulty.

In those cases where the remedy has been borne well, it is not advisable to omit its use suddenly. We have seen frequently a severe relapse to follow this practice, but by diminishing the dose at the rate of a grain *or* two daily, these effects can be avoided. In those cases where the tartar emetic is not borne, or its use seems inadmissible, I have generally recourse to a mercurial treatment: this is to be conducted both by the internal and external use of mercury. Calomel, combined with blue pill and opium, is to be administered every third hour, and its action assisted by mercurial frictions, and the application of the ointment to blistered surfaces. I have no experience in the treatment by very large doses of calomel, as recommended by Dr. Graves and Dr. Hudson.

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* Alluding to the opinion of Rasori, Laennec says : "If I have been correctly informed, he considers the tolerance as owing to the excess of stimulus existing in the system, and which produces the disease ; and according to him, as soon as the excess of stimulus is destroyed by the contra-stimulant effect of the tartar emetic the tolerance ought to cease. It is certainly true that after the acute period of the disease the tolerance diminishes or sometimes entirely ceases, but it is more common to find the patient become habituated to the medicine, insomuch, that during convalescence, and when he has begun to use as much food as in health, he will take daily, without knowing it, six, nine, twelve, and even eighteen grains of emetic tartar."—Laennec, Forbes' *Translation*, p. 238.

Laennec has been severely censured for his statement, that the gastro-enteritis of fever does not contra-indicate the use of the tartar emetic. I apprehend that in this matter he has been scarcely done justice to, for there is every reason to believe that he makes use of the term gastro-enteritis in the conventional mode then so prevalent in Paris, and in which gastro-enteritis and fever were convertible terms. There is no ground for believing that Laennec would give tartar emetic in acute gastritis, and his statement is reducible to this, that the remedy may be employed in the pneumonia of fever; and without entering into his reasoning on the subject we must agree with him, that the contra-indications to the use of this, as of all other medicines, ought to be founded on experience alone. It is now proved, that the existence of typhous fever does not contra-indicate the use of tartar emetic, but that, on the contrary, its exhibition may be followed by the happiest effects; the *gastro-enteritis of Broussais* then, does not contra-indicate the use of this remedy.

But in conducting the mercurial treatment it must never be forgotten, that the direct antiphlogistic powers of the remedy are much inferior to those of tartar emetic, and, indeed, that their very existence may be questioned. I have always found that the mercurial action seems rather a result than the cause of the first reduction of disease. While the fever continues high, a complete resistance to mercurial action most commonly exists, and too often is precious time lost in the attempt to salivate, when a direct antiphlogistic treatment would have modified the disease, and induced the ptyalism. It will always be found that the facility of salivation will be directly as the reduction of the fever. This resistance to mercurial action is less frequently seen in the simple than the complicated cases of pneumonia, in which the curious symptom of vaccillating mercurial action may frequently be observed: thus, in a case where the remedy has been exhibited for the space of thirty-six or forty-eight hours, the gums may become spongy and the breath mercurial, and every thing seems to promise that the desired object will be fulfilled, but in a few hours all these appearances cease, the gums become again hard, and the fœtor subsides; this is generally accompanied by an aggravation of symptoms, on the subsidence of which, another of these attempts at ptyalism may be observed, and in the course of a single case this circumstance may occur three or four times; salivation is almost never established, and the case too often proves fatal.

In some cases I have found that the previous exhibition of tartar emetic seems remarkably to facilitate the mercurial action, and the reverse of this may also occur, and the happiest effects be seen from tartar emetic, in cases where mercury has been previously exhibited. In many cases both modes of treatment may be employed.

Cases of unresolved hepatizations, in patients either apyrexial or labouring under hectic, are extremely common, as a result of routine practice and neglect of the stethoscope in the early treatment of the disease. In these cases mercury has a better effect than the tartar emetic, and the best treatment consists in its cautious exhibition, combined with repeated local bleedings and counter-irritation. In many cases I have employed the seton with the best effects. I have also used iodine, both internally and externally, but without decided advantage. These hepatizations are more common after the typhoid or asthenic pneumonia, and many weeks, or even months, may elapse, before the lung is restored to health; the cure is not unfrequently accompanied by atrophy of the lung and contraction of the chest, under which circumstances the resolution is pointed out more by the re-appearance of the respiratory murmur than the clearness on percussion. But in these cases our efforts will often be nearly unavailing, unless careful attention is paid to the position of the patient, so as to relieve the diseased portion from hypostatic congestion. The patient is to be encouraged to lie on the opposite side, and where the posterior half of the lung is engaged, lying on the face for a certain time every day will have the best effect. In many cases, where remedies seemed to have little or no effect, attention to position has been followed by a rapid recovery.*

It will often happen, whether in cases treated on the antimonial or mercurial plans, that the lung continues in a congestive state, accompanied with copious bronchial secretion. In this case the treatment recommended for the second stage of bronchitis is to be carried into effect, when the bronchial affection in general yields. In a few cases, however, the tubes become dilated, and though the constitutional symptoms disappear, the respiratory phenomena are not restored to their natural condition. This was well exemplified in the case of a gentleman of strong habit who was attacked with a violent double pneumonia, attended from an early period with a copious expectoration of mucus or muco-purulent matter; his life was long despaired of, but after removal to the country, he gradually mended. A seton was inserted, and frequent changes of air had recourse to. In about a year and a half I again examined him; he had recovered his flesh, strength, and appearance, and only complained of a little dyspnœa on exercise; the whole chest sounded naturally on percussion, and the respiration over the anterior, postero-superior, and lateral portions was healthy, while in both infra-scapular regions, nothing was audible but an exceedingly large mucous rale. I again examined him after the interval of some months with the same results; and when we connect the physical signs with the history of the case, there seems little doubt of the correctness of my conclusion. It is obvious, that in a case like this, an error may be committed by unavailing attempts at removing these physical signs, and the practitioner must rest satisfied with curing the constitutional symptoms, and not injure his patient by unavailing treatment.

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* See on this subject a paper by M. Gerdy, published in the Archives Generales de Medicine, on the Influence of Position in modifying the Phenomena of Disease.

Treatment of Typhoid Pneumonia.—We may enumerate the principal points of difference between the treatment of the typhoid and that of the preceding variety: they are as follows:

1st. That general blood-letting is to be used with extreme caution.

2nd. That the mercurial is in general to be substituted for the antimonial treatment.

3rd. That counter-irritation may be employed at an earlier period.

4th. That the vital forces are to be carefully supported.

5th. That as gastro-intestinal disease frequently complicates the pneumonia, close attention must be paid to the abdominal viscera.

6th. That stimulants are to be used with greater boldness and at an earlier period.

In this disease the use of the lancet is often inadmissible; I have frequently seen patients faint after the loss of four or five ounces of blood, and this has occurred without any beneficial effect on the disease. In a few cases, where the disease has occurred in the young and otherwise robust individual, I have employed the lancet with caution, but in the feebler constitution its employment seems to be both hazardous and unnecessary. Local bleeding, however, particularly with cupping-glasses, is always beneficial, and may be again and again repeated while the patient is using wine and other stimulants. Blisters should be used from an early period, and while these means are being employed, the system is, if possible, to be brought under the influence of mercury; the patient should be in general swathed in flannel, and the warmth of his extremities carefully supported.

But in many cases we must attend to the abdominal complication, and it is often advisable to apply leeches to the epigastric or ileo-cœcal regions, to use poultices to the belly, emollient or anodyne injections, and, in short, to put the usual treatment of gastro-enteritis into full effect. In this affection great caution must be observed in the use of purgative dicines, and should the internal exhibition of mercury induce diarrhœa, it must be omitted, and inunction substituted.

The remedies which I have found to answer best in the advanced stage of the disease, where the patient becomes hectic with a copious expectoration, are the decoction of seneka with carbonate of ammonia, and the different preparations of bark. Of these the first has in general answered best. In this condition, however, it would be always advisable that the patient should change his air.

APPENDIX TO THE PRECEDING SECTION.

Since the preceding observations were written, M. Louis has given the results of his experience, drawn from the numerical method, as to the effect of bleeding and other treatment in pneumonia, I shall give his conclusions in his own words.

"1st. That bleeding has a favourable influence on the progress of pneumonia; that it shortens its duration; but that this influence is much less than is commonly believed; so that other things being equal, those patients who have been bled in the four first days of the disease, were only cured four or five days sooner than those who have been bled at a later period.

"2ndly. That we cannot cut short a pneumonia by venesection, at least during the first days of the disease. And if the contrary has been believed to occur, it is, doubtless, because we have confounded this disease with others, or that in some rare cases, the first bleeding causes the general symptoms to subside rapidly, while the local phenomena continued for the most part to advance.

"3rdly. That age has a great influence on the progress and termination of pneumonia.

"4thly. That the tartrate of antimony, in large doses, given in those cases when bleeding has been unsuccessful, has a favourable action, and seems to diminish the mortality of the disease.

"5thly. That blisters have no evident action on the progress of pneumonia; and that without any loss, they may be banished from the treament of those cases of pleurisy and pericarditis which occur in healthy subjects."

On these conclusions a few observations may be offered.

It is difficult to explain the results furnished by M. Louis's tables, with respect to bleeding in pneumonia. To find that, with the exception of the first few days, it matters little at what period we bleed, is indeed an unexpected result, and one which is opposed to the experience of all practical men in this country. It may be observed, however, that M. Louis has not separated the sthenic from the asthenic, or typhoid pneumonia; and as we know that the lancet has comparatively little efficacy in the latter form, we must conclude, and without impugning the method or accuracy of M. Louis, that its value in the sthenic pneumonia is greater than what appears from these calculations.

In addition, it may be observed, that no mention is made of local bleedings having been employed in connexion with the lancet; had these means been extensively employed, there would, doubtless, have been stronger evidence in favour of blood-letting. It is certainly true that we can seldom cut short a pneumonia by bleeding. In two instances only have I seen this result, but the common effect of general bleeding is to remove or modify the constitutional symptoms.

In some cases the affection is merely converted from a manifest *into a latent but progressive disease*, while in others the lung continues unresolved, and in a passive condition. In such cases tubercle, chronic induration, and atrophy are commonly the results.

I cannot agree with M. Louis in his opinion as to blisters, though I admit they are often unsuccessfully and injuriously employed, but when a pneumonia has supervened on a chronic catarrh; in the sthenic form, when the inflammatory symptoms have been removed, and in all cases of the typhoid affection, blistering, when properly conducted, has the happiest effects.*

CHRONIC PNEUMONIA.

Considered as an original affection, there can be no doubt that simple chronic pneumonia is a rare disease; but it is difficult to define the exact meaning of the term *chronic pneumonia*, or to draw the line of distinction between it and that low irritation of the lung which is followed by the tubercular infiltration. It seems not unlikely that there are two forms of the disease, the one producing the iron-grey, and indurated lung; and the other forming, or ultimately passing into tubercular solidity. The first we may call the simple chronic, and the second the scrofulous pneumonia; and, perhaps, many cases of the senile phthisis may be referred to the second variety.

These forms of disease differ remarkably in their liability to produce suppuration. In the scrofulous affection, suppuration, though slow in its occurrence, is almost sure to supervene; while in the simple form abscess is seldom observed, the termination being in that hard and semi-cartilaginous condition, the "*induration gris*" of Andral.

In two cases, however, I have seen a chronic abscess of the lung, without any evidence of a tubercular condition; to this I have already alluded.

We must agree with Doctor Forbes, that although the essentially chronic inflammation of the lung is extremely rare, its occurrence, as a sequel of the acute disease imperfectly resolved, or as complicating other lesions, is by no means uncommon.

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* See my observations on blistering, under the head of Bronchitis.

On these subjects the reader may consult the works of Laennec, Broussais, Chomel, Andral, Louis, and Forbes.

Physical Signs of Chronic Pneumonia.—These signs though essentially the same as in the acute disease, yet differ from them principally in the greater slowness of their changes, and in the absence of the phenomena of local excitation, whether physical or vital.

But it is in the occurrence of atrophy of the lung, and the consequent contraction of the chest, that the peculiarity of the signs of this disease is seen. It will not, however, be necessary to repeat what I have already said when describing the physical signs of pneumonia.

SECTION V.

GANGRENE OF THE LUNG.

I HAVE placed this disease after pneumonia independent of any theoretical considerations. Its close connexion with pneumonia and congestion of the lung, however, will justify an arrangement adopted principally for convenience.

I shall not discuss the nature of this affection, but content myself with giving an abstract of a few cases which have fallen under my own observation.

CASE I.—A middle aged man was attacked with symptoms of pneumonia, in consequence of a contused injury of the right side; from these he partially recovered, when he was thrown from a car, and received a second injury on the same side. Cough, with a dark coloured and offensive expectoration, and occasional hæmoptysis, set in. He was admitted into hospital in the seventh week of his illness, with extreme prostration; the countenance was of a leaden hue; the respiration seventy-two in a minute; breath fœtid; the cough constant, with expectoration of a yellowish-white purulent matter. By the stethoscope a large cavity was detected in the right lung. The patient died on the fourth day after admission.

Inspection.—A vast gangrenous abscess occupied the whole posterior part of the right lung; the cavity was eight inches in length, four in breadth, and two in depth; this contained a large, moist, and soft slough of an extreme fœtor, and the upper part of the cavity was lined with a distinct layer of coagulable lymph.

This cavity had extensive communication with the bronchial tubes. Having placed it under water, we found, by inserting a blow-pipe into the pulmonary artery, that air in great quantity could be made to rise from the surface of the cavity: the left lung was extensively inflamed.

Case II.—A man, aged 28, of a full habit, laboured for a year under palpitation, cough, and pains of the sides; he was admitted into hospital, stating that on the day before he had had rigor with great increase of pain. He had frequent cough with dark coloured expectoration; the pulse was rapid; he lay on the right side; the breath had the characteristic fœtor of gangrene, and there was a cadaverous smell from the whole body; countenance of a leaden hue; lips livid; the right side sounded dull, and a cavity was detected in the mammary region. In five days after admission he was attacked with severe inflammation of the left lung; copious hæmoptysis followed; and he died on the ninth day after admission.

Inspection.—The right lung was solid and strongly adherent; the upper lobe presented the third and fourth stages of inflammation. At about four inches from the summit an anfractuous cavity existed, having three prolongations extending in different directions; most of this cavity was filled with a substance resembling putrid flax, of an exceedingly fœtid odour. This cavity was evidently chronic, as its walls were firm, and lined with a cartilaginous membrane. Many of the bronchial tubes were dilated; the lower half of the left lung was in a state of deliquescent sphacelus, the affected part being surrounded by a band of hepatization, beyond which the tissue was healthy and crepitating.

Case III.—A man, aged 26, who had been previously healthy, and not subject to cough, while intoxicated and very warm, bathed and remained for a considerable time in the water; on coming out he felt very cold, he again indulged in drinking, and became a second time intoxicated; he partly undressed, and lay for the whole day on the left side, on a cold and damp floor; on the following day he was attacked with violent symptoms of pleuro-pneumonia, and in about three weeks coughed up some dark coloured fluid blood; he then became hectic, and was admitted on the 1st of September, He was greatly emaciated, had extreme prostration of strength, and coughed up large quantities of a fœtid greenish matter; the breath was extremely fœtid, and the skin hot; the supero-anterior portion of the left side sounded dull, while between the third and fifth ribs a cavity could be easily detected.

This patient was treated by the chloride of lime, with wine and opium. The most rapid and marked amendment followed; in a few days the fœtor of breath and expectoration had disappeared; no inconvenience whatever was experienced from the remedy; we also directed the covering of the bed to be sprinkled with a solution of the salt. The remedy being omitted, in two days the fœtor returned, and fever began to appear; but these symptoms again subsided with rapidity, on his resuming the medicine. The patient was ultimately discharged, greatly improved in strength and flesh; he, however, sometime afterwards relapsed, and died in the country.

Case IV.—A labourer, aged about 32, habitually intemperate, while intoxicated fell into a canal, and after sitting for some time in his wet clothes, was seized with a rigor; on the next day he had cough, pain in the side, and difficulty of breathing; and was admitted into the Meath Hospital on the third day after the accident. He presented the usual symptoms of typhoid pneumonia, the anterior and lateral portions of the right side sounding dull, with absence of respiration; in the course of the day, *the dulness extended over the whole of the right side, without any preceding crepitus being observed;* on the next day the prostration was extreme, and the breath slightly fœtid; the fœtor increased remarkably towards evening, and a copious expectoration of dark coloured sanious fluid took place. The fœtor was much increased after coughing; the countenance became sunk; but the peculiar leaden hue was never observed: on the next day the signs of a cavity were detected; and the patient died on the following evening.

Inspection.—The right lung was generally adherent; externally it appeared solid, but there existed a large cavity in the anterior portion, extending backwards and downwards; this cavity occupied the lower lobe; it was not lined by any false membrane, but contained a quantity of sanious fluid, similar to what had been expectorated. Its walls were formed by the pulmonary tissue, which was solid, softened, and of a dirty reddish colour, but not presenting the granular appearance of ordinary pneumonia.

On comparing these cases, they will be found more or less analogous; and they all present inflammation preceding and accompanying the disease. It is yet to be determined whether the occurrence of gangrene depends on the suddenness and completeness of congestion, or on the general morbid state of the patient. No doubt both causes influence its production. In all the cases which I have seen, the patients were long addicted to the use of spirits. With respect to the violence of congestion, the exciting causes of the disease would favour such an occurrence. In the second case, the patient received two contused injuries of the chest; and I have known of others in which gangrene followed this accident. In the third case, the circumstances are just such as would produce intense congestion; and the fourth is an example of the typhoid pneumonia which I have described as producing solidity without preceding crepitating rale.*

Notwithstanding the general similarity of my cases, their history presents some interesting points of difference which may be thus enumerated.

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* Two cases of recovery from gangrenous abscess of the lung are recorded; one by Dr. Williams in his article on Pneumonia, in the Cyclopædia of Practical Medicine; the other by Dr. Hudson, in the Dublin Journal of Medical Science, vol. vii.

These cases were examples of typhoid pneumonia running into gangrenous abscess similar to the one which I have given. In my case the pneumonia was quite sufficient to destroy life, even if no gangrene had formed.

1st Case. Chronic circumscribed gangrene, with an isolated slough in one lung, succeeded by acute sphacelus in the other.

2nd Case. Enormous gangrenous abscess succeeding to contused injury of the chest.

3rd Case. Gangrenous cavity occurring under circumstances calculated to produce extreme congestion of the lung.

4th Case. Acute gangrenous abscess, supervening on typhoid pneumonia.

I have not found any peculiar physical signs in the gangrenous abscess of the lung. I believe that the only pathognomonic symptom is the extraordinary and disgusting odour of the breath and expectoration, making the patient loathsome to himself and all around him; the stench, however, is not constant, for during the progress of a case it may disappear more than once; in some cases the expectoration is fœtid, while the breath is free from odour, and it will be often necessary that the patient be made to cough in order to produce the stench.

Treatment of Gangrene.—It seems probable that the mortality of this disease is to be in part explained by the absorption of a septic poison into the system, inducing a state analogous to that described by Gaspard and Magendie, as consequent on the introduction of putrid matters into the economy; and this view is borne out by the result of treatment; for the only remedies which I have seen to give relief are those calculated to check putrescence. In the year 1830, I first prescribed chlorine in a case of gangrene of the lung, and I have since had several opportunities of witnessing its beneficial effects; and have often found that the remedy, for a time at least, completely removed the fœtor of breath and expectoration, and produced the most remarkable improvement in the constitutional symptoms. The remedy may be exhibited either in the form of the chloride of lime or soda, combined with opium. The strength of the patient must be supported by wine and nourishing food; and the remedy continued long after the fœtor has subsided, for I have more than once found that its omission was followed by the return of the unfavourable symptoms. I do not formally propose this as a remedy for gangrene of the lung, but feel certain that its use will lessen the miseries of the patient, and by correcting the putrescence, assist the curative efforts of nature.*

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* Of the cases which I have given above, the second and third are recorded in the Dublin Hospital Reports.—See vols iv. and v.

SECTION VI.

PERFORATING ABSCESS OF THE LUNG.

We may thus designate those cases where purulent collections form exterior to the lung, but afterwards perforate its tissue, and are evacuated by the bronchial tubes. This termination may be observed in the following cases:—

1st. Abscess of the thoracic or abdominal integuments passing across the pleura by adhesion, and forming a fistulous communication with the lung.

2ndly. Purulent collections in the serous membrane, opening directly into the lung.

3dly. Hepatic abscess perforating the diaphragm, and being discharged through the bronchial tubes.*

Of these the last is the most frequent. As its diagnosis is of importance in a practical point of view, I shall dwell upon it here.

We may apply to the diagnosis of the opening of hepatic abscess into the lung, the same principles which guide us in all cases where the matter is evacuated internally. The grounds of the diagnosis are, *the occurrence of new and extraordinary symptoms, co-incident with the subsidence of the hepatic distention.* Now we may make two divisions of the internal openings, according as these lead into shut sacs, as the serous membranes, or into cavities having external communications, such as the digestive canal or bronchial tubes; the cases of the first class being almost always fatal, while in those of the second, recovery is by no means unfrequent.

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* With reference to the subject of perforation of the lung, I would refer to the essay of M. Berton on Bronchial Phthisis. See the translation of his memoir in the Dublin Journal of Medical Science, vol. vii. In the same volume there is a valuable paper by Dr. Froriep of Berlin, on abscesses of the neck, in which he gives a case of abscess of the anterior mediastinum, communicating with the vena cava and lung. See the Medizinische Zeitung, July, 1834.

In applying these views to practice, we find that the *sudden occurrence* of inflammation of a serous membrane, points out the rupture into a shut sac; while purulent discharges from the rectum or stomach mark the opening into the gastro-intestinal tube. Lastly, a copious, sudden, and purulent expectoration shews that the lung has been made subservient to the evacuation of the matter. Empyema rarely results from this perforation, for, in consequence of adhesions, the matter almost always crosses the pleural cavity, and enters the pulmonary tissue. No case of empyema from this cause has ever come before me, while I have seen several in which the matter was completely expectorated, and in which perfect recovery followed.

When I speak of pleuritis, I shall allude to the second case of perforation, in which an original collection in the serous membrane opens into the lung. Of the first variety the following case is a singular instance.

CASE I.—*Abscess of the Abdominal Parietes resting on the convex surface of the Liver, opening externally, and also perforating the Diaphragm, and forming a fistulous communication with the Bronchial Tubes.*

A woman, aged 23, was attacked with cough and hæmoptysis, followed, after some days, by fever. Soon after this she complained of pain in the right side of the chest and hypochondrium, increased by coughing, pressure, or motion. She had a distressing short cough, with yellow, tenacious expectoration. The inferior portion of the right side sounded dull; and the respiration was here almost inaudible, except on a forced inspiration. The symptoms having continued for about a fortnight, an uncircumscribed tumour appeared between the second and third ribs of the right side; the hæmoptysis returned, with a hard teasing cough, but the fever disappeared. Poultices were diligently applied to the tumour, which rapidly enlarged, and became fluctuating. It was opened on the thirteenth day, when a great quantity of matter mixed with blood, was discharged; at this time the hæmoptysis ceased. In about three weeks, however, the abscess again appeared, and rapidly increased to a size much greater than before; it was again opened, and a large quantity of purulent matter given exit to. Next day it presented the appearance of an enormous anthrax, with edges about two inches high, from which a quantity of whitish slough could be detached by pressure. The patient was now emaciated; had diarrhœa with cough; and sanguinolent and puriform expectoration. We endeavoured to trace the extent of the disease, by introducing a probe; but although this was found to pass extensively under the muscles and cellular substance, yet it could not be introduced either into the thoracic or abdominal cavity. After some time it was found, that when the patient coughed, air escaped with great violence from the base of the ulcer. A circular fistula was now discovered, through which a probe could be passed upwards for about three inches, when it met with a solid resisting body. The infra-mammary region sounded clear, while the respiration was cavernous, and accompanied during inspiration by a sound like the tick of a watch. When the patient coughed or made a forced inspiration, a loud gurgling was audible; there was no metallic tinkling, bourdonnement, or pectoriloquism; but the voice resounded strongly from the sixth rib upwards, while anteriorly and posteriorly the respiratory murmur appeared natural. She soon after sunk.

Inspection.—Great emaciation; the external sore extended from the sixth to the tenth rib, and was about four inches in breadth. Between the eighth and ninth ribs the fistula was plainly observable. The peritoneum was healthy, with the exception of that portion which covered the liver laterally and superiorly. Here the liver adhered to the diaphragm.

On the centre of the convex surface of the liver, we found the base of the abscess, formed by a circular portion of thick, false membrane of about two inches in diameter, *external to the hepatic peritoneum,* but producing a depression on its surface. The costal portion of the diaphragm, for an extent corresponding to the base of the abscess, was destroyed, but adhered round its edges. This abscess communicated with the right lung by a perforation through the diaphragm, of the same size as the external fistula, which led into a cavity in the lower lobe, narrow, elongated upwards, and presenting many of the characters of a pneumonic abscess. It had no lining membrane, and communicated with numerous bronchial tubes. Around it the pulmonary tissue was of a greyish white colour, softened, but not granular; the diseased portion did not terminate by any distinct line, and occupied about two-thirds of the lower lobe, which adhered to the diaphragm and costal pleura; the remainder of the lung was healthy.*

This is the only case in which I have had an opportunity of examining the mechanism of the transit of pus across the lung. An ulcerous cavity communicating with the bronchial tubes, and being itself the continuation of the diaphragmatic fistula, was found to exist, and its presence during life was easily detected by auscultation. It may be inquired whether the cavity in the lung was the result of the purulent infiltration merely, or caused by a distinct attack of pneumonia. It seems more probable that the lower lobe of the lung suffered simultaneously with the liver, and that thus it was prepared for the irruption of a foreign substance into the bronchial tubes. I do not affirm that this occurs in all cases, for I have seen several instances in which the symptoms left no doubt as to what had happened, yet in which the stethoscope failed to detect the cavity. Viewed with reference to physical diagnosis, the case furnishes an example of large abscess in the lung without pectoriloquism. I once thought that this was explicable by the fact of the cavity having an external opening which would prevent the reverberations of the voice, but I have since seen several cases of phthisical cavities, in which this phenomenon was wanting, although free bronchial communication existed. Further observations are necessary to determine the conditions which regulate the occurrence of pectoriloquism.

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* Clinical Report of the Meath Hospital, Dub. Hosp. Reports, vol. v. See the Cyclopædia of Practical Medicine, Art. *Inflammation of the Liver.*

The next case is a remarkable instance of the extent of organic lesion, compatible with life.

CASE II.—*Fistulous openings from the Pleura into the Lung and Liver; Gangrenous Abscess of the Lung; Empyema and Pneumo-thorax; fistulous opening of the Liver into the transverse arch of the Colon.*

A middle aged man had for some time laboured under the symptoms of empyema, when it was proposed to remove the fluid by paracentesis; he was then seen by a late distinguished friend of mine, who ascertained the presence not only of empyema, but pneumo-thorax, with pulmonary fistula. In addition to these symptoms it was found, that on sitting up, the patient was immediately attacked with a tendency to diarrhœa, and discharged a sero-purulent fluid in considerable quantity, *per anum;* on lying down the discharge always ceased. On dissection the following lesions were found: a gangrenous cavity existed in the upper portion of the right lung, communicating with the bronchial tubes and pleura; this sac, the upper part of which contained air in quantity, was about half filled with a yellowish and fœtid liquid, in which were found the debris of numerous hydatids. A large opening passed through the diaphragm into the substance of the liver, and from this cavity another fistula proceeded to the ascending colon; so that a false passage was formed from the bronchial tubes to the colon and rectum, and the singular symptom of diarrhœa in the erect position, satisfactorily explained.*

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* Professor Carswell has recorded a case very similar to the above. He says: " When the diaphragm adheres to the abscess, and is perforated, three consequences may follow: the contents of the abscess may pass into the cavity of the

The next case illustrates the opening of an hepatic abscess into the left lung.

CASE III.—*Fever with Jaundice; subsequent hepatic abscess opening into the left Lung.*

During the epidemic fever of 1826 and 1827, which occurred in Dublin, a man, aged 28, was attacked on the fourth day of his fever with jaundice, and the formidable symptoms of yellow fever, to which so many at that time fell victims.* The symptoms were subdued by the most active treatment, and after some time he was discharged. In about a fortnight, however, he was admitted, labouring under hectic fever, with a continued dry cough. Fearing that he was becoming phthisical, I repeatedly examined both lungs with the greatest

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chest; into the bronchi from a portion of the lung which had adhered to the diaphragm, having been destroyed by ulceration or sloughing; or into the cavity of the chest and bronchi at the same time. We have only seen one case of the last variety of perforation of abscess of the liver, or, more correctly speaking, of a purulent cyst containing a great number of hydatids. Although these vesicular animals have sometimes been expectorated in cases of this kind, such did not happen in the case to which we allude. The communication between the bronchi and cyst took place first, followed by a yellow-coloured expectoration, which, because of the existence of the cyst in the liver having previously been detected, was supposed to be owing to the passage of the bile into the bronchi from perforation. Soon afterwards symptoms of pleurisy manifested themselves, accompanied with those of effusion and pneumo-thorax, the real nature of which was not understood until after death. Only one opening was found in the diaphragm, where it covered a cyst from six to seven inches in diameter, containing a yellow, puriform fluid, and hydatids; this opening, sufficiently large to admit the fore-finger, communicated with an excavation formed in the inferior lobe of the lung, which adhered but slightly to the diaphragm. In the bottom of this excavation there were several openings, some of them, which were small, communicating with the bronchi, others larger, leading into the cavity of the pleura. This cavity contained a quantity of air, yellow sero-purulent fluid, and a great number of large and small hydatids. The lung was considerably compressed, and the pleura covered with recent coagulable lymph."—*Cyclopædia of Practical Medicine*, Art. *Perforation of Viscera.*

* See Cyclopædia of Practical Medicine, Art. *Enteritis*, for a brief account of this extraordinary and fatal form of disease.

care, but in no part of the thorax could I find any thing that would account for the symptoms. His distress increased, when he suddenly began to expectorate large quantities of purulent matter; and during the first night he discharged nearly two pounds of perfectly formed pus. On the following morning, the left lung, *which the day previously had presented no morbid sign whatever, either by the stethoscope or percussion*, was found over the whole region of the lower lobe completely dull, and with extinction of the respiratory murmur. There was no bronchial respiration, resonance of the voice, dilatation of the side, nor displacement of the heart; nor any symptom of either pleuritic or pneumonic inflammation. The patient continued to expectorate copiously for some days; after the second day the morbid phenomena began to subside. We had, first, a mucous rattle audible at the root of the lung, which gradually extended over the dull portion, and was followed by a return of the respiratory murmur and resonance of the voice.

This stethoscopic observation, for the accuracy of which I pledge myself, is explicable only by the sudden filling of all the bronchial tubes with purulent matter. Let us observe, first, the sudden snpervention of dulness, and absence of respiration in a patient whose chest, the day before, presented no morbid phenomenon; this is accompanied by a copious expectoration of purulent matter; and there are no constitutional symptoms of pleurisy or pueumonia. The absence of these symptoms is of great importance, because if the disease had proceeded from either of these lesions, it must have been of extraordinary violence, and would have certainly been accompanied by high constitutional and local symptoms. Dilatation of the side, and displacement of the heart, were wanting, so that the diagnosis lay between hepatization of the lung, and *the sudden filling of the tubes with pus;* but there was no bronchial respiration, nor resonance of the voice, which would have occurred had it been hepatization, but which were absent because the large tubes were completely filled. Further, during the recovery of the patient, the phenomena of the voice were exactly the reverse of those in pneumonic resolution. In the latter, the resonance decreases, while in this case it increased; in hepatization, because the air cells recover their permeability, and the morbid subsides into the natural bronchophony; in the case under consideration, on the other hand, because the emptying of the tubes permitted the return of the *natural resonance* of the voice. In the majority of cases the matter discharged from the chest consists of well formed pus. In one, however, recorded by Annesley, the opening of an hepatic abscess was followed by a copious purulent and bloody expectoration. The patient experienced a great sense of suffocation when he lay on his back; and on dissection, a vast hepatic abscess was found communicating with the posterior portion of the lung. We have witnessed a case of the same lesion, in which, whenever the patient turned on the left side, a large quantity of purulent matter was discharged from the mouth.

It is hardly possible to confound this accident with any disease of the lung properly so called, particularly if by stethoscopic observation *we have been satisfied of the previously healthy condition of the organ.* The only cases which might be confounded with it, are the rare instances of the opening of an empyema into the lung, or the sudden secretion of purulent matter in quantity, by the bronchial membrane, of which a few instances are recorded.

We have now seen, with reference to auscultation, that three cases of perforating abscess of the lung may be distinguished, viz.—those with signs of excavation; next, those in which pneumo-thorax occurs; and lastly, cases presenting the phenomena of a complete filling of the bronchial tubes with purulent matter.

But there is a fourth class in which, although no doubt can exist of the emptying of an hepatic abscess through the air tubes, the stethoscopic signs are unsatisfactory. I have now seen two cases in which the trajet of the purulent matter was not marked by any auscultatory sign; can it be, that in such cases, the matter passing through the posterior mediastinum enters the trachea at its posterior portion, and is thus evacuated without involving the lung?

SECTION VII.

CANCER OF THE LUNG.

As yet almost nothing has been done in establishing the diagnosis of this disease. Laennec states that "the stethoscope ought to detect its existence;" but gives no case in which auscultation was employed: and authors, as far as I know, are silent on the subject. The observations which I have to offer apply to the diagnosis of intra-thoracic cancer generally, without reference to the varieties of the disease. Of these the encephaloid matter, the cephaloma of Carswell, seems the most frequent.

Cancerous disease of the lung is met with in two forms; in the first a degeneration of the lung occurs, and the organ is transformed into a cancerous mass without the production of any tumour. In the second, the schirrous or encephaloid matter forms a tumour, at first external to, and ultimately displacing the lung. In neither case can we apply any direct diagnosis; and I do not know how the first could be determined with certainty. The symptoms are always obscure; and the physical signs being merely those of solidity, more or less extensive, the greatest difficulty exists in making an accurate diagnosis. Repeated observations, indeed, might lead us to doubt whether the lesion was any ordinary disease—and the existence of external cancer would give a probability that the internal affection was of the same nature. But in a case seen for the first time, and in which no such external disease existed, we have no means by which its nature could be positively determined.

But, in the second case, the physical condition of parts is different, and we have a mass producing compression, displacement, and obliteration of organs, and all the physical signs of an intra-thoracic tumour. The lung may be displaced, the œsophagus, trachea, or bronchial tubes compressed, the subclavian or carotid arteries, or the vena innominata, obliterated, *leaving no doubt of the existence of a tumour, the nature of which must be determined by other means.*

As illustrative of these principles, the following cases may be studied. The first shows the difficulty of diagnosis in the simple degeneration of the lung.*

A man, aged thirty-six, about a year previous to his final admission into the Meath Hospital, was attacked with occasional stitches of the right side, followed by cough, hoarseness, dyspnœa, and scanty mucous expectoration—after some time a little tinged with blood. The face and neck became œdematous, and the swelling was observed to be greater on the right side. He came under my care in the spring of 1832, and remained about six weeks in hospital, during which time, after most careful and repeated examinations, I remained undecided as to the nature of the disease. He left the hospital somewhat relieved, but without any change in the physical signs, which were that *the whole side sounded dull, yet without the accompanying physical signs of a great empyema on the one hand, or of pneumonia or tubercular solidity on the other.* I successively formed and abandoned many opinions, and ultimately gave up the attempt to determine the nature of the disease.

Soon after this he came under Dr. Graves's care, labouring under extreme dyspnœa. He could only lie on the right side; he had cough, with occasional scanty expectoration, slightly tinged with blood, pain of the right shoulder, and slight stitches of the side. He experienced some difficulty of swallowing, and referred the obstruction to the lower part of the throat—the face was bloated, pale, and slightly œdematous, which, with an appearance of the eyes as if the balls were protruded from the sockets, and a marked dilatation of the nostrils during breathing, gave his countenance an expression of distress and suffering. *The right jugular vein was much distended, as were the veins in the right axilla ; but this symptom was chiefly remarkable on the surface of the belly, where two veins corresponding to the situation of the superior epigastric artery pursued a remarkably tortuous course along each side of the linea alba, being turgid and dilated to the size of swan quills.* His bowels were constipated and subject to griping pains ; urine scanty and high coloured; loss of appetite ; night sweats; slight thirst ; tongue clean ; pulse 100, regular and compressible.

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* See Dr. Graves's Paper, Dublin Medical Journal, vol. iv., from which I have abridged the above case; the patient was first under my own, and afterwards his observation.

The intercostal spaces on the left side were more distinct, deeper, and more dilated in respiration, than those on the right ; the latter, however, although not so well marked, were by no means obliterated or distended by pressure from within. The right side of the chest measured about half an inch less than the left. The left side sounded everywhere clear, to within an inch of the sternal median line where it became dull. Right side, universally, as dull as possible. Over the whole left side the respiration was puerile, except on approaching the sternal median line, where it assumed a tracheal character. This tracheal respiration was observed over a great part of the right side anteriorly, where it was very loud and distinct above the mamma, feebler immediately below it, and almost entirely lost still lower. Posteriorly, the respiration was not so decidedly tracheal.

No rales were audible in any part of the chest.

At the upper and anterior part of the right side, the voice was resonant, approaching to, if not identical with bronchophony ; elsewhere nothing remarkable was observed.

The heart pulsated in its natural situation, but its sounds were audible under both clavicles, and over the whole of the right side. The right side of the chest, during respiration, obviously moved much less than the left; and when he spoke, the hand placed on it felt the vibrations caused by the voice to be feebler than on the left.

"The physical phenomena here detailed," says Dr. Graves, "remained unvaried until his death, except that all traces of bronchial respiration soon disappeared from the right side of his chest, except at one spot near the spine, and where anything was heard in other parts, it was now evidently a tracheal wheezing which masked all other sounds.

"When this patient entered the hospital on the 1st May, the abdomen felt natural, and no enlargement of the liver could be felt, but after some time the liver appeared to have been rapidly altered, and could be distinctly felt far beyond its usual limits, and forming a hard visible tumour in the hypochondriac and epigastric regions. At the same time his stools became clay-coloured, and he was jaundiced. The yellow colour, however, was not of a deep, but of a light lemon shade.

"Another remarkable phenomenon developed itself before the termination of the disease; whenever he lay down, that instant a loud wheezing was heard in his chest, accompanied by a sensation of imminent suffocation; the dysphagia increased likewise, but was never very urgent.

"Three tumours had been observed on his body, and they had latterly increased in size with great rapidity. They were immediately under the skin, (which was of the natural colour,) were smooth, of a round form, of the size of walnuts when first observed, but now are very nearly as large as oranges. They were slightly moveable at first, more fixed afterwards, and never accompanied by the least pain or soreness: at first they felt solid, but afterwards more elastic, as if they were distended with fluid contained in a firm capsule; they occurred on the forehead, the ramus of the lower jaw, and near the lumbar spinous processes.

" *Dissection.* — *Chest.* — Left lung collapsed, perfectly healthy. Right lung, or rather the contents of the right side of the thorax, adhere every where to the parietes, by means of an intimate adhesion between the pleura costalis and pulmonalis. The pleura is exceedingly thickened and dense. In place of the right lung was found a solid mass, weighing more than six pounds, with an irregular, somewhat nodulated surface; this mass filled completely the right cavity, but did not protrude between the ribs, so as to distend, notably, the intercostal spaces; it encroached, however, upon the other side of the chest, extending a little beyond the median line, enveloping, and nearly concealing from view, the pericardium, great vessels, and trachea. This solid mass was removed with difficulty on account of the adhesions, and was found to present, over a small portion of its posterior surface, a thin stratum of lung, nearly impervious to the air. The solid mass was found to be everywhere homogeneous, firm, of a white colour slightly stained with bile, and tolerably firm and consistent in its structure, which resembled a brain partly hardened by artificial means. When cut, each section exhibited an oozing of the softer brain-like fluid from the exposed surfaces, which oozing was much increased by pressure; so much indeed, that it was obvious that the soft cerebriform matter, bore a large proportion to the cellular and other structure in which it was lodged, and upon which the firmness and apparent solidity of the whole depended. The mass was somewhat lobulated posteriorly, and contained a few small cysts filled with a jaundiced serum. The right bronchial tube could be traced for a short distance into the substance of the mass, but was considerably diminished in calibre; the heart was pale, and rather atrophied; its great vessels seemed to run through the substance of the mass which surrounded the base of the heart, so that only its lower part was visible.

" Contrary to expectation, the liver was found perfectly natural in size, but the gall-bladder was enormously distended with bile, and was at least three times its natural size. The apparent tumefaction of the liver was owing to its being depressed by the thoracic tumour. A tumour, consisting of several smaller ones, occupied the situation of some of the mesenteric glands, and equalled two fists in size. It consisted of the same cerebriform substance as that observed in the chest, and appeared to have arisen from degeneration of the mesenteric glands. This tumour pushing the transverse arch of the colon upwards, and the small intestines downwards, pressed upon the ductus communis choledochus, so as to prevent altogether the passage of bile into the duodenum, while its lateral portions extending to the kidnies pressed upon these organs. The substance of the liver was healthy but green, being injected with bile."

In this important case, the want of agreement between the physical signs, and those of the ordinary affections of the lung, the absence of the signs of the earlier stages of pneumonia, while the lung advanced to solidity, and the contraction of the side, while the dulness extended beyond the mesian line, made strongly against the opinion that the disease was hepatization.

In the next place, the phenomena did not accord with those of tubercular solidity. The disease spread from below upwards; the solidity was complete, and no sign whatever of tubercular softening was observed; if we add to these the healthy state of the opposite lung, and the absence of symptoms of phthisis, we have a group of circumstances opposed to the phenomena of tubercle.

Lastly, it was at one time supposed that the case was empyema, but with this the signs were also irreconcileable; the side was contracted, the intercostal spaces unaffected, the vibration of the voice was not extinguished, position made no difference in the signs, the heart was in its natural situation, and the liver not displaced until a short time before death. *The dulness and absence of respiration, if proceeding from empyema, would point out the greatest possible effusion, yet* *the remaining phenomena were inconsistent with this condition.*

But other unusual circumstances existed: namely, the varicose state of the subcutaneous veins, the dysphagia, the predominance of œdema on the right side, the apparent enlargement of the liver, and the growth of those external tumours which were, doubtless, of the same nature as the internal lesion. We must then admit that there was here a group of phenomena irreconcileable with those of pneumonia, phthisis, or empyema, but which were explained by the condition of the lung.

The next case is illustrative of the second form, or that in which the cancerous disease forms a compressing tumour. A woman, aged 30, had laboured some months under cough, mucous expectoration, and great debility. On admission into hospital the countenance was livid and anxious; dyspnœa considerable; pulse quick and small. She had frequent cough with mucous expectoration, but presented no symptom of abdominal disease. Next to the cough, she complained most of difficulty of swallowing, which she referred to a lump in her throat, existing under the top of the sternum. This had existed for some months, but had lately much increased. The pharynx appeared healthy, and no tumour could be felt by external examination.

The clavicle, antero-superior, and infra-spinous regions of the left side sounded completely dull; the respiration was here distinctly bronchial, and the resonance of the voice approached to perfect pectoriloquism. Over the rest of the lung, the sound on percussion was clear, but respiration was masked by bronchitic rales. In the right lung the respiration was puerile.

From these observations we concluded, that the superior portion of the left lung was solid, in all probability from tubercle. We could not, however, explain the dysphagia. She expired on the night following her admission.

The left lung was found compressed from above downwards, by an extensive encephaloid tumour, which filled the posterior mediastinum, and extended into the upper portion of the left thoracic cavity. The trachea and œsophagus, from the lower portion of the neck downwards, were enveloped by this mass. At the left side, exactly at the situation to which the patient referred the obstruction in swallowing, the tumour formed three lobes or masses, each about the size of a pigeon's egg. One of these so pressed on the œsophagus as to form an elevation on its internal surface, and considerably diminish its calibre. The sub-clavicular and acromial regions were filled by the tumour, which answered exactly to Laennec's description of the *non-encysted cerebriform masses :* no softening had commenced in any portion of it. The lung proportionably diminished in size, contained numerous masses of the same nature, varying from the size of a pea to that of a kidney bean. The right lung was healthy.*

When describing the pulsation of the lung in pneumonia, I alluded to a case of encephaloid tumour, with a diastolic throbbing which simulated an aneurism of the aorta. I shall now detail this novel and important case.

The patient, a man aged 45, of full habit, had for the four years previous to his death, complained of occasional severe pains in the left side. These attacks were generally attended with hæmoptysis, and yielded to general bleeding, nauseating doses of tartar emetic, and other antiphlogistic measures. He was recovering from one of these attacks, when he was seized with convulsions, followed by paralysis of the left side. The attack frequently recurred with many of the characters of epilepsy, during which the dyspnœa increased. The pains of the side became more constant, and extended to the shoulder and inter-scapular region ; he complained of oppression, wheezing, and some palpitation, and had a continued mucous and bloody expectoration.

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* Clinical Report of Cases in the Medical Wards of the Meath Hospital, &c. Dub. Hos. Reports. vol. v.

I saw this patient with Mr. Carmichael two months previous to his death; he was not emaciated, nor hectic. He complained of some dyspnœa, with severe pain in the left shoulder. The respiration was tracheal and of the character which I have described when speaking of the pressure of tumours on the windpipe; voice unaffected. There was some dysphagia, and the pulse of the left radial artery was exceedingly small, while that of the right was full and developed. The whole antero-superior portion of the left side, and the corresponding scapular ridge, sounded completely dull. In these situations there existed a distinct tracheal respiration; the respiratory murmur was audible over the lower lobe, but was extremely feeble when compared with that of the right lung.*

But the most remarkable circumstance in this case was, that a distinct double pulsation, a little subsequent to that of the heart, and accompanied by the bellows'-murmur, existed in the upper sternal and sub-clavicular regions. The sounds were almost identical with those of a deep-seated aneurism, and although there existed no external tumour, a distinct diastolic pulsation could be perceived by the hand when pressed on the chest. This pulsation manifestly succeeded that of the heart, the action of which was natural, so that the existence of two distinct centres of pulsation within the chest did not admit of the slightest doubt.

No signs of tubercular softening could be found in any part of the chest.

The diagnosis in this case was full of difficulty. Some extensive organic disease obviously existed; the pains, the dulness of sound, the hæmoptysis, and the absence of vesicular murmur, seemed at first to favour the opinion that tubercular solidity existed, while the absence of emaciation, of hectic, and of the signs of cavities, did not accord with such an idea.

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* For observations on the importance of feebleness of respiration in one lung in cases of intra-thoracic tumour, I would refer to the section on Diseases of the Larynx; also to my paper on the Diagnosis of Aneurism, Dublin Journal of Medical Science, vol. v.

On the other hand, there were signs altogether inconsistent with the existence of mere pulmonary disease. The tracheal breathing, the dysphagia, the smallness of the left pulse, and the pulsation of the upper part of the thorax, all indicated that a tumour existed within the cavity.

Some time previous to his death he suddenly expectorated fœtid purulent matter; this continued to be copiously discharged for several days, giving the impression that a gangrenous abscess had formed.

Dissection.—Upon laying open the cavity of the thorax, a large tumour was observed occupying the left lung from its apex to its root; it closely adhered to the parietes of the chest; it was of a globular form, larger than an orange, perfectly white in colour, remarkably elastic to the feel, and of different degrees of firmness, but no where possessing the hardness of a schirrous structure; it completely surrounded the left branch of the pulmonary artery, and projected into the pericardium. When a section was made through the tumour, the trunk of the pulmonary artery was seen compressed and flattened, its section presented an elliptical form, and its calibre was so much diminished as to admit only a full-sized catheter; the lung beneath the tumour was in an inflamed condition, and at one part there existed a cavity, which in appearance and in the nature of its contents resembled a gangrenous abscess; there were no tubercles in the lungs; both hemispheres of the brain were extensively softened in their interior, as were also both lobes of the cerebellum.*

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* It would be interesting to examine whether in this instance the pulsation was from the vessels of the cerebriform mass, or communicated by the pulmonary artery. I incline strongly to the latter opinion. The nature of the pulsation of

The great interest of this case consists in the cancerous mass forming a second centre of pulsation, and in its other signs agreeing so closely with aneurism :—that a tumour of some kind existed, appeared evident to Mr. Carmichael and me, long previous to the disease, and with the knowledge I then possessed, I could only explain the phenomena on the supposition of aneurism. It is true that no external tumour existed, and that the pulsation was feebler than what occurs in most cases of this disease.

There were two circumstances, however, which did not agree with the symptoms of aneurism, the one, *the continued hæmoptysis,* and the other *the want of proportion between the apparent size of the tumour and the strength of its pulsations.* We know that the violence of pulsation is in general proportional to the size of the tumour, so that the combination of extensive dulness with but feeble pulsation, may indicate cancerous rather than aneurismal disease.

The preceding facts shew that there would be grounds for suspecting the existence of cancerous disease in two cases.

First.—Where there were evidences of simple solidification without the signs of pneumonia or tubercle.

Secondly.—Where there were evidences of an intra-thoracic tumour; in which case the diagnosis would lie between a pulsating cancer and an aneurism of the aorta.

It need scarcely be observed, that the existence of external cancerous disease would aid in settling the question, but such a combination is by no means constant, and even when present, the visceral may precede the external cancer, as in the case which I have given.

But there is a point connected with the physical signs, which

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cancerous tumours is still to be determined, but if it appears that the thoracic cancers only pulsate when embracing a large vessel, the value of the sign as indicative of tumour, will be so far diminished.

must not be passed over. In none of our cases were there any evidences of cavities forming in the cancerous mass; and there is no instance recorded in which the stethoscopic signs of ulceration have been observed. In my third case, indeed, a gangrenous cavity formed a little before death, but this engaged the lung, it did not occur in the cancerous structure, and was evidently accidental. Bayle details a case of ulcerated cancer of the lung, but does not state whether the cavities communicated with the bronchial tubes. I shall hereafter subjoin an abstract of this case. In the same author we find an instance recorded of the combination of tubercle and cancer; here the diagnosis, from physical phenomena at least, would be impossible.

Andral has described two cases of cancerous disease within the thorax, but in one only had the affection a direct influence on the stethoscopic signs.

An old man labouring under diarrhœa entered La Charité in a state of extreme emaciation. He had cough with purulent expectoration. On the left side the respiratory murmur was intense, even to puerility, while on the right it was much more feeble. On both sides the sound on percussion was equal, and a mixture of mucous and sonorous rales could be heard over the chest.

On dissection the root of the right lung was found occupied by an enormous mass of melanosis which seemed to have sprung from the bronchial glands, of which, however, no trace remained. The right bronchus was involved in this mass, and so compressed by it, as that its calibre was scarcely half that of the opposite tube.*

Another case is related by the same author, in which melanotic masses occurred within the substance of the lung. No compressing tumour was formed, and consequently the stethoscopic signs were unsatisfactory, no physical indication existing except some dulness of the upper portion of the lung. The patient died in consequence of obstruction of one of the bronchial tubes of the opposite side, by a mass of inspissated mucus, but this seemed to have no connexion with the cancerous disease.*

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* Clinique Medicale, Maladies de Poitrine.

A remarkable case is recorded by Dr. Carswell, which illustrates the rapid and extensive development which may occur in the medullary form of the disease. The affection occurred in a young man about twenty-five years of age, who six weeks previous to his admission into hospital performed the active duties of a soldier. He complained only of difficulty of breathing; occasionally he had a slight cough followed by the expectoration of a small quantity of mucus. The difficulty of respiration rapidly increased, and terminated in asphyxia without the occurrence of fever or emaciation. Both lungs were nearly filled with large masses of medullary sarcoma.†

From the preceding facts we may conclude—

1st. That the facility of diagnosis in cancer of the lung, depends mainly on the anatomical disposition of the disease.

2nd. That we may divide the cases of this affection into those in which simple degeneration without change of volume, occurs; and those in which tumours exist causing compression and displacement.

3rd. That in the first class, the physical diagnosis is difficult, while in the second, it depends on the evidences of an intra-thoracic tumour.

4th. That as intra-thoracic tumours are in general either aneurismal or cancerous, the diagnosis will lie between these forms of disease.

5th. That there are no physical signs peculiar to cancer of the lung.

6th. That in the case of simple degeneration of the lung, we find evidences of solidity, without the usual phenomena of either pneumonia or tubercle.

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* Clinique Medicale, Maladies de Poitrine.

† Cyclopædia of Practical Medicine; Article, Schirrus.

7th. That the rarity of signs of ulceration of the lung affords an additional diagnostic between this disease and tubercle.

8th. That in the second variety, in which cancerous tumours form external to the lung, the disease may also occur in the substance of the organ.

9th. That such cases are to be recognized, more by the existence of the tumour, than by the disease of the pulmonary tissue.

10th. That the mediastinum may be so displaced as to cause dulness beyond the mesian line, and the liver displaced, yet without protrusion of the intercostal spaces.

11th. That dysphagia may occur in both varieties of the disease.

12th. That the gradual diminution, and ultimate subsidence of vesicular murmur, with the tracheal respiration, resonance of the voice, and complete dulness on percussion, are the principal physical signs of the first variety.

13th. That the occurrence of these phenomena without the precursory signs of pneumonia, pleurisy, or tubercle, would justify a suspicion of the disease.

14th. That the physical signs of the second form may simulate those of aortic aneurism in its early stages.

15th. That under these circumstances we may have localized dulness, a double pulsation, with bellows' sound, difference of the radial pulses, tracheal breathing, dysphagia, palpitation, and pain in the shoulder.

16th. That the feebleness of pulsation, connected with the extent of dulness, may assist in distinguishing the disease from aneurism.

17th. That a cancerous tumour may exist within the thorax without pulsation.

18th. That it may compress one bronchus so as to produce a feeble respiration in the corresponding lung.

19th. That a chronic bronchitis frequently complicates the disease.

20th. That a varicose state of the jugular, mammary, and epigastric veins, may be produced in cancer of the lung.

21st. That though the existence of external cancer may often aid in diagnosis, yet the disease may be all through internal; or the visceral precede the external cancer.

APPENDIX TO THE PRECEDING SECTION.

It has been already stated, that Bayle described the combination of tuberculous cavities with cancer; and also, an example of the softening of cancer of the lung; yet without those anatomical details which we require, in order to know what the stethoscopic signs would have been. Of these cases bearing on the diagnosis of tubercle and cancer, I shall presently give an abstract.

Finally, Dr. Houston has described a cancer of the lung, which dilated the side; this case I shall also give, as it bears on the diagnosis between cancer and pleurisy.

Under the name of cancerous phthisis, we find three cases of the disease related by Bayle.

Case I.—A man, aged 55 years, of a bilious temperament, was attacked with dyspnœa, a dry cough occurring in paroxysms, and pains of the chest. The skin became gradually yellow, although the conjunctiva preserved its natural colour. Towards the tenth month of his disease the skin became dry and rough, and the cough, which was frequent, was followed by scanty mucous expectoration, after some time succeeded by slight hæmoptysis, which continued for seventeen days.

Fifteen months elapsed, yet the patient's strength was scarcely diminished, the expectoration became purulent, and he sometimes felt severe pains in the chest. Soon after this, he was attacked with adynamic fever, from which he recovered in about a month; the cough increased, the expectoration became more abundant, and the patient rapidly emaciated. At this time, a soft and fluctuating tumour, unaccompanied by pain or change of colour of the skin, appeared above the humeral extremity of the right clavicle. The patient sunk in the eighteenth month of his disease.

Dissection.—Both lungs were found to contain numerous tumours of a rounded form, and of a structure similar to that of fresh lard, they had a shining white-colour, and were of various degrees of hardness: some red capillaries, similar to those of the brain, could be seen ramifying in their substance, from some of these tumours a whitish pus of a creamy consistence could be expressed, while others were converted into true ulcerations, around which the pulmonary tissue was slightly hardened; abdominal viscera healthy.

CASE II.—A man, aged 35 years, was affected with a tumour on the forearm, which, after continuing for ten years, increased so rapidly as to render amputation necessary; but the operation was postponed on account of dyspnœa which had existed for some time; on this subsiding, the operation was performed, but the pectoral symptoms returned, and the patient died with suffocation on the twentieth day after operation.

The lungs contained numerous tumours of the cerebriform matter, of different degrees of consistence, and supplied by capillaries. In some, excavations could be perceived, filled with a serous or bloody fluid; some of which were lined with a delicate and vascular membrane, while others seemed to result from the destruction of the cerebriform matter itself.

The pulmonary tissue between the tumours was perfectly healthy.

Case III.—A man, aged 72 years, had enjoyed good health until within six weeks of his admission into hospital, his disease set in with pains affecting the whole body, but principally engaging the chest and epigastrium. A slight cough, with a white and opaque expectoration, set in, the appetite failed, and the bowels became obstinately costive; the liver was enlarged and irregular, filling the epigastrium, and extending almost to the umbilicus. Three hard, indolent, moveable bodies, of about the size of nuts, were found to exist in the epigastric and right hypochondric regions.

On dissection the lungs presented few adhesions, and appeared externally healthy. On cutting through them the root of the left lung was found occupied by a mass of a shining white appearance, in the interior of which red capillary vessels could be seen. In the centre of this substance, which resembled brain, and also in the lung itself, tuberculous masses could be detected, easily distinguished from the cancerous matter by their yellow opaque appearance; several small tuberculous cavities were found in the remainder of the lung. The liver contained numerous cerebriform masses, and the moveable subcutaneous bodies were evidently of the same nature as the internal tumours.*

The next case is that given by Dr. Houston.† He describes the preparation as "a rare specimen of diseased lung presented to the Museum of the Royal College of Surgeons by the late Professor Todd, but of which no sufficient history was procured, as the individual, the subject of it, was in a dying state when brought into hospital. It was only learned that the disease had been the work of years; that the individual who bore it had never been much affected with pain; that the principal features of the complaint had been a continually increasing difficulty of breathing and distressing dry cough, aggravated at times by exposure to cold or attempts at hard labour; and that the right side had been latterly observed to grow larger than the left; the patient was about twenty years of age.

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* Recherches sur la Phthsie Pulmonaire, par G. L. Bayle, Paris, 1810.

† See Dublin Medical Journal, vol. iii.

"On dissection, some hours after death, both lungs were found much diseased, but the right was particularly altered in structure. Tumours of various sizes, from that of a pea to an orange, were interspersed every where throughout it in such masses, as to have caused the absorption of nearly the whole of the original structure. The larger bronchial tubes,—some thin strata of vesicular lung, among the the less overgrown tumours, with a small part of the superior lobe, were the only traces left unchanged. The tumours were all encysted from the commencement; they consisted of a glairy, thick material, of a white colour like pus, supported in a fine cellular web which grew from the inner surface of the cyst, and gave such a body to the tumour, that when cut into, it retained its form and did not fall to pieces. From their first formation to their fullest growth, the tumours partook of the same characters; the only perceptible difference between the very small and very large ones lay in their greater tendency, as they enlarged, to adhere and run into each other, and in the increasing proportion of fluid to solid parts. The fluid admitted of separation from the cellular basis by friction or maceration in water. A preparation made in this way is preserved in the Museum, shewing the cyst and cellular tissue of one of the tumours.

"This diseased mass adhered firmly at every point to the parietes of the chest; had even distended the cavity in which it lay, had protruded the intercostal spaces, and pushed away considerably the mediastinum and heart. The disease had made less progress in the left than in the right lung; and in both, its advancement was greater in the lower than the upper lobe."

It is plain, with reference to the cases by Bayle, that they cannot be made available for establishing the physical diagnosis. This has been already spoken of. In Mr. Todd's case, the account of symptoms is insufficient, and further observations are necessary to determine, whether, with respect to mere dilatation, a pulmonary cancer can ever simulate an empyema.

SECTION VIII.

TUBERCLE OF THE LUNG.

In conformity with the plan of this work, I shall confine myself solely to the diagnosis and treatment of phthisis, and only discuss the pathology of tubercle incidentally, and so far as may be necessary for the elucidation of the subject.

The diagnosis in this affection is drawn from the study of the former and actually existing symptoms *considered in relation to the physical signs and their mutations.* It is to be recollected that there are no physical signs peculiar to tubercle; it is in their combinations, situation, successive changes, and connexion with pure symptoms that they have their value.

It is not to be denied, that a correct diagnosis of phthisis may be frequently made without the aid of physical signs, for there are abundant cases presenting such a combination of circumstances, as to render the existence of tubercle all but certain; these are the more obvious, ordinary, and advanced cases. But in the earlier periods, when the diagnosis is practically useful, and in that vast category of cases in no respect corresponding to the description of books, the symptomatologist is continually at fault. We shall not enter, therefore, into a detailed account of symptoms, for it would be a hopeless task to frame any description which would apply even to the majority of cases, but after having examined the sources of the physical signs, we shall combine and study the symptoms and signs of the more prominent varieties of the disease.

As in phthisis all the structures of the lung may be engaged, so in a single case we may meet every known auscultatory sign of disease of the mucous membrane, parenchyma, and serous investment. These occur in infinitely various combinations, according to the degree of irritation, the number of tissues engaged, the extent of ulceration, and the chronicity of the disease.

In the first section of this work I have shown how comparison aids us in physical diagnosis, and there is no disease in which it is so applicable as phthisis. In this respect an important division may be made, of those cases, on the one hand, in which comparison subserves to diagnosis; and those in which the phenomena being similar and universal, the principle is inapplicable. In the first class, or that in which the disease is originally local, may be placed by far the greater number of cases, for those in which the disease engages the whole lung in a nearly equable manner are exceedingly rare.

For example, the existence of tubercle of the upper portion of one lung is recognized by the difference between its physical signs and that of the lower lobe; in other words, by applying comparison. And in like manner, if the whole of one lung be diseased we recognize the lesion by comparing it with the other. But when tubercle is scattered equably throughout both lungs, and accompanied everywhere by the same amount of irritation, then the diagnosis becomes difficult indeed, and can only be arrived at by successive observations.

Let us now enumerate the physical signs of pulmonary phthisis.

1st. *Signs of irritation.*
a. Of the mucous membrane.
b. Of the air cells, or parenchyma.
c. Of the serous membrane.
2nd. *Signs of solidification.*
3rd. *Signs of ulceration.*
4th. *Signs of atrophy.*
5th. *Signs referrible to the circulating system.*
a. Action of the heart.
b. Of the arteries.
c. Displacement of the heart.

I shall examine these sources of diagnosis separately.

SIGNS OF BRONCHIAL IRRITATION.—In the great majority of cases these proceed and accompany the development of tubercle, and the rales occur in every degree of intensity and variety of combination. In some a single occasional mucous bubble is the only sign, while in others the respiration is altogether masked by a combination of the sonorous, sibilous, and muco-crepitating rales. These signs are audible under the clavicle, in the axilla, or in the acromial or supra-spinous regions; in some cases accompanying the ordinary breathing, in others only audible *on a forced inspiration*, and thus it commonly happens that the signs escape the superficial observer, for the murmur may be pure during ordinary breathing, and yet intense bronchial rales be revealed by a forced expansion.*

Of these rales the most common are, the mucous and muco-crepitating, next in frequency are the sibilous, while the rarest are the deep-toned sonorous rales. These results we might expect from the tuberculous irritation first engaging the minute air tubes. Connected with this we find that although these phenomena may exist simultaneously in the subclavicular, axillary, and postero-superior portions, yet that their existence in one of these situations does not imply that we can detect them in the others. The utility of this rule in examination is obvious, but in most cases we may content ourselves with exploring the anterior and posterior faces of the lung.

Combined with the direct signs of bronchial irritation we find in most cases a feebleness of the vesicular murmur, and a shade of dulness of the clavicle or spinous ridge. The less musical the rale the greater the probability that these signs shall accompany it, but we may have a loud musical rale, or scattered mucous bubbles, with clearness of sound, and even a puerile respiration.

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* To Dr. Forbes is due the great merit of first pointing out the importance of investigating the respiration in the earliest stages of phthisis, a subject which Laennec comparatively neglected.

Now if it be asked, what gives these signs of bronchitis their value as diagnostics of incipient tubercle, the answer is, that it is not by their mere characters, (for these do not differ from ordinary bronchitis,) but it is from their situation, localization, and combination with comparative dulness of sound that they derive this value. The same phenomena scattered over, or even existing intensely throughout the lung, but being equable and unaccompanied by dulness, would not only have no value in the diagnosis of phthisis, but would render the existence of tubercle improbable.

Simple bronchitis is seldom circumscribed, while that of the consumptive is commonly so; the latter begins in the upper portion of the lung, remains obstinately fixed in the air tubes, gradually spreads downwards, and while in its first stages in the lower lobe, is combined with tuberculous ulceration in the upper; it may be intense in the upper lobe while the lower is altogether free, or engage the whole of one lung while the other is scarcely affected. These are not the characters of ordinary bronchitis.

These observations apply to the ordinary cases in which the tubercle and bronchial irritation are at first local and advance together, but the whole lung may be simultaneously and equably tuberculated, when of course these principles do not apply. The cases may be divided into two classes, the acute and chronic. As these cases shall be hereafter considered, I shall now allude to them only in connexion with bronchitis.

In the first or acute form a patient previously in good health is suddenly attacked with the most violent symptoms; there is high fever, extreme dyspnœa, lividity, and tenacious expectoration. In the early periods the chest sounds clear, but the signs of the most intense bronchitis affecting the tubes of all diameters are universally audible. The symptoms and signs continue with unabated violence, and after a few days *the whole chest presents a certain degree of dulness.* The patient dies from the violence of the pulmonary inflammation, and on dissection every bronchial tube is found inflamed, and the lung equably and closely studded with the miliary and granular tubercles. In the second or chronic case, the lung becomes, as in the former, equally tuberculated, but with a much lower degree of bronchial irritation; the disease goes on for a long period; the bronchial signs scarcely predominate in any one part of the lung, but are accompanied by general, and sometimes decided dulness.

When the upper lobe contains a sufficient quantity of tubercle to give dulness of sound, a large mucous or muco-crepitating rale is often observable over the lower portions, and hence we commonly find that while cavities or anfractuosities exist superiorly, the signs of bronchitis alone are to be observed below; and I have often been led to the discovery of tubercle in the upper lobe, by this lurking bronchitis confined to the lower portion of a single lung.

Signs of Irritation of the Parenchyma.—It is sometimes difficult to distinguish between these and the preceding signs. The crepitating rales, feebleness of respiration, and dulness of sound, may be enumerated as the phenomena of this class; yet of these the first alone can be properly said to indicate parenchymatous inflammation; the second may be explained on other principles; and the third has characters very different from that in simple pneumonia.

But the crepitating rale of pneumonia is rarely observed in phthisis, and I have never heard it unless on a forced inspiration; it is then accompanied with a degree of dulness; unlike the rale of pneumonia it hardly ever disappears, to be replaced by bronchial respiration, but passes imperceptibly from the finest crepitus to the gurgling of anfractuosities.

Even when acute pneumonia of the lower lobe succeeds to chronic phthisis, the crepitation continues much longer than in the ordinary disease.

There is in phthisis a remarkable character of the crepitating and finer muco-crepitating rales which must be noticed; these signs may occur in a very circumscribed portion of the lung, and after existing twenty-four or forty-eight hours, disappear, but again to return in about the same time; and they may thus recur and subside many times in the course of a few weeks. I look upon this recurrent crepitus as an excellent diagnostic in many obscure cases, and in one, although the place of its first appearance was not in the superior portion, yet it satisfied me that tubercle existed, and dissection verified the opinion.

Lastly, we find that local depletion frequently removes these finer rales for a time, and this is almost always accompanied by diminution or removal of the hectic, and a general relief. When on the treatment of phthisis, I shall return to this subject.

Let us now examine the important sign of *feebleness of respiration.*

Of the different signs of incipient phthisis there is none more important than this; it is to be ascertained by comparison of the corresponding portions of the lungs, and of the upper with the lower lobes, the observation being made on the forced, as well as the ordinary respiration.

I have found that in many individuals there is a natural difference between the intensity of the murmur in either lung, and in such cases, with scarcely an exception, the murmur of the left is distinctly louder than that of the right lung. This character is particularly evident in females, and nervous individuals, and has not been noticed by Laennec. It is of the greatest importance to bear it in mind, as we may thus be often relieved from the anxiety which such a discovery might produce. The following circumstances serve to distinguish this natural feebleness of respiration.

1st. Its occurrence in the right lung.

2nd. Its being unaccompanied by rale or dulness of sound on percussion.

3rd. Its being the same over the whole lung, and not confined to the upper portion merely, as in incipient phthisis.

It need scarcely be added, that the value of feebleness of respiration is greater when it occurs in the left than the right lung.

So many causes concur to produce morbid feebleness of respiration that it is difficult to explain it by a reference to any one of them. All the pathologic states of the lung in incipient phthisis tend to this result. The bronchial irritation, the adhesive obliteration of the minute tubes, and the deposition of tubercle, would all produce a feeble respiratory murmur. Of these, however, the second cause is probably the most important, and the fact of feebleness of respiration occurring at so early a period, is what we might expect from the obliteration of a certain number of minute tubes before the air-cells had been filled up or the intervening tissue consolidated.* To this subject I have already alluded in the section on Bronchitis.

But there is a feebleness of respiration which is difficult of explanation, and which seems to result from a spastic state of the lung. The following is a remarkable instance of this:—

A boy, aged 12 years, after recovering from a succession of eruptive fevers, by which he was greatly reduced, became suddenly affected with glandular swellings on the right side of the neck. These increased rapidly; the whole chain of lymphatic glands from the clavicle to the mastoid process became enlarged and indurated, causing considerable deformity. In little more than a fortnight, however, the tumours had nearly disappeared, when he was attacked with a violent cough, difficulty of breathing, and acceleration of pulse. I saw him on the third day of this new illness; all traces of the glandular swellings had subsided, the breathing was hurried, and the cough dry. *Both sides of the chest sounded perfectly well; but while the respiration was loud over the left lung and lower half of the right, it was totally absent over the whole right upper lobe.* Bleeding from the arm was performed, and the axilla was freely leeched; and on the next day the respiratory murmur had returned with nearly its natural intensity. The lymphatic swellings now began to re-appear, and in less than a week had attained their former magnitude, the chest being completely relieved. Iodine was now used both externally and internally. For upwards of two weeks the tumours resisted the remedy, when they suddenly began to disappear, and in three days nothing was left but a slight induration above the clavicle. Cough, pain, acceleration of breathing, and quickness of pulse set in, and the respiration of the upper lobe became as before extinct, while it was intensely puerile in the other portions.

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* See M. Reynaud's Memoir on Obliteration of the Minute Bronchial Tubes, Memoires de l'Academie Royale de Medecine, tom. iv. 1835. The paper is translated in the Dublin Journal of Medical Science, vol. vii.

Leeching and blistering were employed on the affected portion; the symptoms were again removed, and again, in the course of a week, did the cervical swellings return. These of course were no longer interfered with, and by a steady perseverance in constitutional treatment the boy gradually recovered; but a year elapsed before the lymphatic tumours had disappeared.

In this important case we see the alternation of scrofulous action between the neck and upper portion of the right lung, for that the patient was twice on the point of passing into acute phthisis no one can reasonably doubt.

But the nature of the feebleness of respiration remains to be ascertained. It occurred as the sole phenomenon; neither rale nor dulness accompanied it, and its subsidence under treatment was followed by the re-appearance of lymphatic irritation of the neck. Was the obliteration of the tubes the result of inflammatory spasm, or a combination of this with the adhesive process?

In the ordinary cases the feebleness of respiration is almost always modified, and often removed, by a timely antiphlogistic and revulsive treatment, and there can be no doubt, that in this way many a patient can be saved from impending consumption.

Connected with this subject we may notice the interrupted respiration, "respiration entrecoupée" of Laennec, in which the inspiratory murmur is broken into a succession of efforts. It indicates the first stage of tubercular irritation, and may be removed by local treatment. As a diagnostic, however, it has no value, unless when it is local, and occuring in a case in which tubercle has been already recognized, when it becomes the *avant courier* of more unequivocal signs.*

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* The interesting phenomenon of the contraction of the muscular fibres of the chest on percussion, must be here noticed. "Some time ago, on percussing a patient who had laboured under a pectoral affection, with several symptoms indicative of tubercular development, we were surprized to observe that after each stroke of the ends of the fingers, a number of little tumours appeared, answering exactly to the number and situation of the points of the fingers where they had struck the integuments of the chest. These having continued visible for a few moments, subsided; but could be again made to appear on repeating the percussion. In this case percussion excited a good deal of pain; the situation in which those little tumours were most apparent was in the subclavicular region, and over the great pectoral muscle. Since this observation we have seen the same phenomenon in a number of cases.

"How far this phenomenon may be connected with, or depending on, internal disease, is yet to be ascertaind. It is seldom met with unless in cases where the patients are emaciated to a certain degree. In these individuals we often find, on using percussion quickly and with some force, that after each blow a degree of pallor is observed in the parts struck, exactly answering to the points of the fingers; this is instantly succeeded by the return of redness, and the erection of a little tumour, which has often a slight quivering motion, and which subsides in the course of one or two seconds.

"We have observed this to occur most frequently in the superior and anterior portions of the chest, but have also met with it in other situations; such as the arms, back, &c. In some cases the patients complained much of pain on percussion; while in others they did not appear to suffer more than usual."—*Clinical Report of Cases in the Medical Wards of the Meath Hospital, during the Session of* 1828 *and* 1829; *Dublin Hospital Reports*, vol. v.

Signs of Irritation of the Serous Membrane.—Although pleural adhesions so commonly attend pulmonary tubercle, yet the physical signs of pleuritis are comparatively rare. I have never found them in the earlier periods, even when the signs of bronchial and parenchymatous irritation were manifest.

It is in the advanced stages, when the upper lobe contains ulcerated tubercle, that the "*frottement*" of Laennec is sometimes discovered in the mammary, lateral, or postero-inferior portions. It is most commonly ushered in by pain of the side, but continues long after this has disappeared; indeed, some of the most remarkable instances of the persistence of *frottement* may be seen in pulmonary phthisis, and the phenomenon may continue for several weeks without decided change.

It almost always exists with clearness of sound, and a perceptible murmur. The patient is frequently conscious of the rubbing, on drawing a deep inspiration,—a sensation quite independent of pain. In the earlier periods, the sensation is communicated to the hand, but the sound may continue for weeks after the signs from touch have disappeared.

The same causes which produce the rarity of *frottement* in pneumonia operate also in phthisis. There is a great similarity between the mode of adhesion in both cases, and the surfaces of the membrane may unite without the conditions which best induce the friction sound.*

There is nothing in this muscular irritability peculiar to phthisis, but that it is commonly connected with irritation of the lung, or pleura, there can be no doubt; and in this way, like the other signs of irritation, it becomes available in the diagnosis of phthisis. It is always more evident in the earlier periods; thus in incipient phthisis it occurs over the primary seat of irritation, while in the confirmed and chronic cases we may often find it absent over the lung first diseased, and strikingly marked on the side last and least engaged.

* The existence of the ordinary pains of the side in consumptive patients does not by any means imply that we can detect the friction signs. The nature of these pains is still obscure, but that injury is commonly done by treating them as if they arose from pleuritis in every case, there can be no doubt. May they not often be neuralgic, or analogous to cancerous pains?

If the phenomena of dry pleuritis be rare in phthisis, those of liquid effusion are still more so.* The signs are the following: *rapid dulness of the lower portion and absence of respiration without the signs of progressive pneumonic solidity.* I have no observations to determine how far the previously tuberculated state of the upper lobe may modify the signs of displacement.

Signs of Solidification.—In phthisis condensation of the lung occurs in two forms. In the first it is complete; in the second incomplete, or as it were interrupted. Of these the first is rare, the second extremely common; consequently the physical signs of *complete solidity* are rarely observed, and this constitutes an important difference between the signs of phthisis and pneumonia, or cancer of the lung.†

Even in cases of the tubercular infiltration, inducing a homogeneous structure, complete solidity is seldom observed, in consequence of ulceration causing an anormal permeability.

A slight dulness of one clavicle or scapular ridge, is one of the earliest signs, and can often be detected only by the most delicate comparative percussion. It may exist with or without stethoscopic signs, and in the earlier periods may vary to a certain degree. We may diminish, or for a time remove, the dulness of sound by treatment, which proves that in the earlier stages it is owing more to the congestion or inflammation of the lung, than to the existence of tubercle.

As in the case of the bronchitic signs, we cannot infer the amount, or existence of dulness of the posterior portion, from the examination of the anterior; or *vice versa*, both clavicles may sound equally well, yet a distinct difference be observed in the ridges of the scapula; and it is obvious that the reverse may happen. In a few cases the dulness begins at about the third rib anteriorly, or the sub-spinous region posteriorly, and spreads upwards; and in a still rarer class we have first dulness of the lower, and afterwards of the upper lobe; but in these cases the disease begins with pneumonia, a chronic hepatization is produced, and the lung becomes slowly tuberculated from below upwards.

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* The case of empyema with pneumo-thorax and fistula is of course excluded.

† In my second case of cancer of the lung, the signs were those of *complete solidity*—perfect dulness, and bronchial respiration. Had I been aware of the rarity of these signs in phthisis, when I saw the case, I would probably have avoided the error in diagnosis.—See page 376.

The clavicular dulness is almost always accompanied by a corresponding feebleness of respiration. But the reverse of this may occur, *and a tubercular dulness of the clavicle coincide with a puerile respiration.* This happens when the posterior half of the lung is greatly condensed, while the anterior remains permeable. As the disease advances, however, the apparent anomaly disappears.

In a few cases the dulness coincides with a bronchial or tracheal respiration. I have already shown why this sign is comparatively rare in phthisis; when it exists, however, it is always most distinct in the erect position, and may then be pure, or what is more frequent, combined with the muco-crepitating or mucous rales. I have often found that the respiration was merely feeble, and without the slightest bronchial character, when the patient was lying down, but on his getting up the bronchial respiration became evident.

As in pneumonia, this appearance of the bronchial respiration proceeds from the greater expansion of the lung.

But the equal sonoriety of both clavicles may coexist with tubercle. It may arise from a small but equal quantity of tubercle in both lungs, or its predominance in one lung posteriorly. In the first case comparison must be instituted between the lower and upper lobes. Delicate and successive percussion of each rib from the sixth upwards must be performed, when the disease will be often discovered.

In doubtful cases condensation can often be detected by the following manœuvre. Having noted the ordinary sound of the clavicle, we are to direct the patient to inspire deeply, and hold in his breath; from obvious reasons, percussion will now detect a difference of sound before imperceptible.

As disease advances, the dulness extending downwards, may occupy the entire lung, but it rarely happens that the whole side is equally dull, the lower generally sounding clearer than the upper portions. General dulness of one side may, however, be met with; I have observed it from the following causes.

First. General tuberculization of the lung, the tubercles being in the crude or ulcerated condition.

Second. Pneumonic solidity of the lower lobe. In most cases the pneumonia is the primary affection.

Third. Effusions into the pleura.

Fourth. Complication with enlarged liver. This only applies to the right side.

Fifth. General solidity, with great atrophy of the whole lung, causing contraction of the side.

Of these cases the first is by far the most common; that of unresolved pneumonia passing into tubercle, is next in frequency. The others are exceedingly rare. The dulness being established is modified in two modes. In the first, ulcerous cavities forming in the lung diminish the dulness, although without restoring the natural sound. When the cavity is empty, the sound is somewhat tympanitic, and often accompanied by the *bruit de pot fele.* When it is large, the sound might be confounded with the natural resonance, but the stethoscope will at once detect the error. The second cause has been already mentioned under the head of Pneumonia. The distention of the stomach with air gives a peculiar resonance to the left lung, and this false clearness, which can be dissipated by a carminative draught, is often made the ground of unfounded hope, and the source of bitter disappointment. It need hardly be observed, however, that to the experienced stethoscopist the mere character of the sound suffices to prevent error.

General acute Development of Tubercle.—Hitherto we have studied the signs of solidification in their ordinary progress, the tubercle being at first localized, and gradually extending. But when the whole lung is equably and simultaneously tuberculated, the diagnosis by comparison becomes impossible. Here the diagnosis is drawn from the succession of physical signs; the chest, as before stated, becomes dull without the usual signs of pneumonia and pleurisy, and in most cases with the phenomena of bronchitis merely. This principle will be elucidated when we discuss the symptoms of phthisis in connexion with physical signs.

In the *general chronic tubercular development* the facility of diagnosis depends mainly on the suppuration of the tubercle: if it be nearly equally developed in both lungs and still in the crude granular condition, the diagnosis is difficult; this may be seen in the general cachexia and in old persons. Bronchial rales, equally diffused, exist, and from the emaciation of the patient, the dulness of sound may escape observation. These cases, too, being almost always of long duration, dilatation of the air cells often occurs, the clearness of which compensates for the dulness of the tubercle. But when suppuration exists the difficulties are removed, and we have either the signs of cavities in the upper portions, or a general mucous or muco-crepitating rale, at once distinguishable from that of mere bronchitis by the general and extreme dulness which accompanies it, for in this suppurative phthisis the dulness is always more decided than in the granular variety.

Let us now enumerate the different modes and circumstances of tubercular dulness:—

1st. Slight variable dulness of the clavicle or scapular ridge, occurring in the first stage, and influenced by treatment.

2nd. Comparative permanent dulness of these situations.

3rd. Both clavicles dull—one more so than the other.

4th. Both clavicles equally dull.

5th. The same with respect to the scapular ridges.

6th. Right clavicle and left scapular ridge dull.

7th. Left clavicle and right scapular ridge dull.

8th. Dulness of the clavicle, the corresponding scapular ridge clear.

9th. Dulness of the scapular ridge, the corresponding clavicle sounding clear.

10th. Dulness most evident at the third rib anteriorly, and the sub-spinous or inter-scapular region posteriorly.

11th. Dulness of the whole upper lobe.

12th. Dulness of the whole lung, most evident superiorly.

13th. Dulness at the root of the lung, extending upwards.

14th. Dulness of the lower lobe proceeding upwards.

15th. Equal dulness of the whole lung, the opposite sounding clear.

16th. Equal dulness of one lung and of the opposite upper lobe.

17th. Comparative dulness with feeble or interrupted respiration.

18th. The same with mucous, or muco-crepitating rale.

19th. The same with semi-tracheal respiration.

20th. The same with puerile respiration under one clavicle.

21st. Complete dulness of one lung with the rale of anfractuosities.

22nd. The same with the usual signs of a well defined cavity.

23rd. Incomplete dulness with the resonance on percussion of a cavity.

24th. Incomplete dulness in the upper lobe from a large excavation; perfect dulness of the lower, from tubercular solidity.

25th. Incomplete dulness, varying with the quantity of fluid contained in an excavation.

26th. General but incomplete dulness of both lungs supervening on bronchitis, or with crepitating rale persisting to the fatal termination.

Other combinations may of course occur, but I have verified the connexion between the above and tubercle in a great number of cases. Of these the most interesting are the sixth and seventh, the twentieth and twenty-sixth cases. The dulness of a clavicle and the opposite scapula is one of the most interesting of the passive signs, it is by no means uncommon, and I have never observed it unless from tubercle.

SIGNS OF ULCERATION.—In most cases the signs of irritation precede and pass into these phenomena. In some, however, the latter appear at once, unpreceded by any active auscultatory sign.

In general nothing can be more gradual than the transition from the crepitating to the muco-crepitating rales, from these to a large mucous rattle, which passes into the rale of anfractuosities, and ultimately the gurgling of a cavity. This is the ordinary course, and a cavity may thus form, *complete dulness having never existed.* In other cases, however, more or less of dulness having existed, the signs of excavation at once appear; this occurs from the softening of a large tubercle or a mass of tubercular infiltration.

On the formation of a cavity in the upper portion, we may often detect smaller ulcerations, or the earlier stages of tubercle in the lower part of the affected lung, and in the upper lobe of the opposite. So rarely, indeed, is tubercle confined to one lung, that the existence of a cavity almost certainly implies disease in the opposite side, even though no physical sign of it should exist.

The signs of an excavation vary according to its situation, size, contents, bronchial communication, and the condition of its walls. The principal are cavernous respiration, rale, and pectoriloquism; of these the two first are by far the most important, for pectoriloquism, about which so much has been written, and on the discovery of which so much importance is placed, is of all the physical signs of phthisis, the least constant, certain, or useful. If the ear be well accustomed to the cavernous respiration and cough, and to the gurgling rales of a cavity, the investigation of pectoriloquism may be safely neglected. Of the circumstances which modify cavernous respiration and rale, the most important is the state of the bronchial communication; the fewer and larger the tubes which open into the cavity the better marked will the signs be, while the communication of a great number of smaller orifices obscures the cavernous respiration, and in place of gurgling produces the intense mucous rale of a cavity, peculiar indeed, but very different from the large cavernous rale. In a few cases the temporary obstruction of the tubes obscures the cavernous phenomena, which may be restored on the patient's coughing; and we thus explain the variation of the physical signs according to the position of the patient. Cases will occur in which the recumbent position obscures the signs of a cavity plainly evident when the patient sits up; the reverse of this is also observed.

The signs are rarely perceptible beyond the situation of the ulcer, and hence the removal of the stethoscope for a single intercostal space shall make us lose them. In the same way, a cavity may be plainly perceptible under the clavicle, and yet without the slightest indication of it posteriorly; nay, we may find a small excavation at the sternal end of the clavicle, while below the humeral the signs are wholly wanting.

When ulceration commences it may be pointed out by a single but well defined bubble, occurring in a situation with feeble or puerile respiration and some dulness. When this is constant we may diagnosticate a cavity of the size of a Spanish nut. As new ulcerations form the rale is multiplied, presents bubbles of various sizes, and is heard over a greater extent. The sound is now more dull, and the respiration either very feeble or semi-tracheal, but cavernous respiration and pectoriloquism are absent, and we make the diagnosis of anfractuosities. At this period the dulness is often very considerable, but the tracheal breathing is not in proportion to it. In some cases the *bruit de pot felé* exists.

A well defined cavity being formed with sufficient bronchial communication, cavernous respiration is produced. This must be explored during ordinary and forced breathing and cough. Upon cavernous respiration and gurgling depend the diagnosis of a cavity.

As yet we know little of the conditions which regulate pectoriloquism, but as a sign of phthisis, it has little value. Its occurrence in cavities of all kinds, ulcerous or not; its varieties; its similarity to morbid broncophonia, often so great as to make it difficult or impossible to distinguish them; its existence as a natural phenomenon in the upper portions of the lungs of many individuals; and its total absence in cases presenting every apparent physical condition for its existence, have long made me consider it as the least important and most fallacious of all the physical signs of phthisis. Doctor Forbes has long come to similar conclusions. Taken alone, it is absolutely without value; but when in combination with other signs, it strengthens the diagnosis. It is to be explored during the ordinary and whispering voice.

In certain cases the existence of strong pectoriloquism is perceptible to the patient, who, from the resonance of his voice, can point out the situation of the cavity.

When the cavity is close to the anterior surface of the lung, the agitations of its fluid contents are often perceptible before we apply the ear to the chest. In this way sounds are produced by the respiration and the action of the heart. In the first case the phenomena are twofold, we may have a distinct gurgling from many bubbles, audible during inspiration and expiration—it is a sort of churning, or, which is more common, we hear a single bubble corresponding to the inspiration, and similar to the tick of a small clock, or watch.* In some cases, upon coughing, this is for a short time removed.

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* It has so happened that all the cases in which I have observed this sign were fatal; it is the death watch of the consumptive.

But a more curious phenomenon is the agitation produced by the action of the heart; it is the rarer of the two. Each pulsation is accompanied with a tick in the cavity, loud enough to enable us easily to reckon the pulse; this is not always audible without the stethoscope, but where the cavity is large, and the chest attenuated and elastic, we may hear it at a distance of a foot or more from the patient. In a case of the most protracted consumption with extreme emaciation, this sound became painfully loud, and of a metallic character on the patient opening the mouth.

This cardiac gurgling may occur in both lungs. I have heard it in the postero-superior portion of the right lung, while it is commonly absent even when the cavity lies upon the pericardium.

When the cavity becomes much enlarged, the metallic character may be communicated to the gurgling, cavernous respiration and voice; of these the metallic gurgling is most common, and the first perceived, for the bubbles will receive the metallic character from a cavity not yet sufficiently large to communicate it to the respiration or voice.

These characters are confined to the situation of the cavity, and hence, where cavernous respiration and gurgling exist under the clavicle, and over the scapula, yet with the metallic characters only audible in one situation, we may diagnosticate two or more cavities, one much larger than the others.

When a cavity exists in the lower portion of the left lung, the distention of the stomach with air may cause the phenomena to become metallic.

The diagnosis between the metallic phenomena of a large cavity, and those of pneumo-thorax with fistula, is not difficult. I shall arrange their characters in opposite pairs.

LARGE CAVITY WITHIN THE LUNG.	PNEUMO-THORAX, FISTULA, EMPYEMA.
1. Metallic phenomena much less developed.	1. Metallic phenomena intense.
2. Signs supervening gradually.	2. Phenomena suddenly developed.
3. Side not dilated. It may be contracted.	3. Side generally dilated.
4. Sound on percussion dull, or with the resonance of a cavity.	4. Percussion exactly indicating the extent of air and liquid.
5. No lateral displacement of the heart.	5. Lateral displacement common.
6. Cavernous rale large.	6. Cavernous rale absent.
7. Sound of fluctuation absent, or indistinct.	7. The reverse.
8. Pectoriloquism often present.	8. Pectoriloquism absent.

With respect to any of these characters, occasional exceptions may occur. In a case seen for the first time, we must never neglect percussion, mensuration, and the signs of cardiac or hepatic displacement.

The second character is almost always available; yet I have known of an instance where the *sudden development* of metallic signs did not proceed from pneumothorax.* The ordinary signs of a cavity had existed for some time, when, during a fit of coughing, the patient was seized with a sudden and violent pain in the side, and felt as if something had given way. The signs became metallic, and the patient soon afterwards sank; it was found that there had been two cavities divided only by a thin partition, this had been ruptured during the fit of coughing, and a cavity was thus produced sufficiently large to cause metallic sounds.

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* This case did not occur under my own observation, but has been communicated to me by a gentleman about whose accuracy there can be no question.

Laennec has given two cases of phthisical cavities producing metallic phenomena. In the first there was distinct pectoriloquism, and when the patient coughed or spoke, the tinkling was heard. The cavity occupied the upper half of the lung, and branched into many anfractuosities. It contained about two spoonfuls of liquid.

In the second case, there were also pectoriloquism, and the metallic tinkling on coughing. A large cavity containing a very little liquid was diagnosticated. Three cavities were found communicating with one another, none of them larger than a pullet's egg. In neither of these cases did succussion produce any sound.

I have found the metallic signs in a few cases. In one the patient had laboured under chronic phthisis of the right lung, when an extensive cavity rapidly formed in the left. The respiration was cavernous, and accompanied by a tinkling sound, similar to that produced by the falling of a pin into a cup of glass. A vast excavation was found in the upper portion of the left lung, communicating with many smaller ones by winding canals. In the lower lobe there was another cavity of the size of a hen's egg.*

In another case, the left side sounded everywhere dull, while over the infero-lateral portion the metallic tinkling was audible after speaking, when a succession of metallic bubbles could be heard. This was not excited by the cough, nor was the voice itself metallic; there was no amphoric resonance nor sound upon succussion, nor was the heart displaced. The patient soon after sunk, the tinkling having more than once subsided and re-appeared during the course of a few days.

We found the left lung universally adherent, and so excavated as to resemble a bag of liquid more than a lung. Two large cavities existed, one in the upper, the other in the lower lobe; these communicated by a fistula into which the finger could be introduced. The upper cavity extended from the interlobular fissure to the summit of the lung; the lower could contain a middle sized orange; both presented numerous anfractuosities, and the lower was nearly filled with a grumous, purulent fluid. They were both traversed by numerous vessels lined with a strong cartilaginous membrane, and had the most extensive and free bronchial communication. In the upper cavity particularly, the tubes seemed as if accurately cut across with a knife. The left lung contained a quantity of crude tubercle.

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* See Dublin Hospital Reports, vol. iv., a Selection of Cases, &c.

In a third case, the metallic tinkling occurred in the last stage of a chronic phthisis. Gurgling and cavernous respiration had existed over the left mammary region; but during the last fortnight of existence, an occasional metallic tinkling became audible. The cavity extended nearly from the apex of the lung to its base; it could contain more than a pint of fluid; its anterior wall was formed of little more than the pleura, and it was crossed by several obliterated blood-vessels. The remainder of the lung was nearly solid from tubercle, which also existed in small quantity in the upper portion of the right lung.

From these facts, it is obvious that the mechanism of the metallic signs is not yet established. These sounds may be intermittent, and may accompany the voice, inspiration, cough, and action of the heart, or exist in connexion with only one of these actions; further, although they generally indicate a large cavity, yet even in this case they are not always present, and may even proceed from several moderately sized excavations, as in the case recorded by Laennec.

It is remarkable that in several of these cases the cavities were multilocular, the divisions being caused by septa of the pulmonary tissue, perforated by fistulæ, or by bands of obliterated vessels. Can this condition have any effect in producing the metallic sounds?*

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* I shall recur to this subject when on Pneumo-thorax, and in the mean time refer to the Work of Dr. Williams, and the Memoir of M. Beau, Archives Generales de Medecine, tome iv., 11 Serie, Mars 1834.

SIGNS FROM ATROPHY OF THE LUNG.—That the volume of the lung is diminished in phthisis was recognized by Bayle, but the subject has never been sufficiently studied. Laennec states, that a contraction of the chest may be observed in very chronic cases, when large cavities are tending to cicatrize.

Numerous observations, however, have convinced me, that the contraction of the chest resulting from atrophy of the lung, begins and may be appreciated at a much earlier period than has been supposed; and further, that in chronic cases, great falling in of the chest may occur from interstitial atrophy, *without the formation of any cavity whatever.* Atrophy of the lung I believe always to attend the earlier stages of tubercle, and is probably produced by the operation of that law, by which an organ loses its volume when its functions are rendered less energetic; and thus as the obliteration of the minute air tubes described by Reynaud advances, the cells become useless, and ultimately disappear.*

But whatever be the mechanism of the change we can recognize it at an early period by accurate measurement of the antero-posterior diameter of the thorax, and in this way measurement is found a most important means of diagnosis in the earlier stages of phthisis. It should never be neglected.† By means of a spring callipers, one knob of which is fixed on the scapula, and the other below the clavicle, the comparative depths of the upper lobes can be at once determined and the most minute difference detected. The circumference of the chest above the mamma, and the distance of the clavicle from the nipple must also be observed. In the earlier stages the difference varies from the eighth of an inch to half an inch, and there is no visible alteration except a flattening or slight hollowing under the clavicle.

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* An interesting illustration of this is recorded by Andral. In dissecting a monkey, M. Reynaud found that one bronchus was compressed by a large ganglion, so as greatly to diminish its calibre; the corresponding lung was singularly atrophied, and the side fallen in as in the absorption of pleuritic effusion.—*Precis d'Anatome Pathologique.*

† The best apparatus for making this measurement is a pair of callipers moving on a graduated arc. When on Empyema I shall describe a modification of this instrument, adapted to all measurements of the chest.

But in the more chronic cases distinct deformity takes place. The antero-superior region becomes extensively flattened or concave, the shoulder depressed, the clavicle flattened, and its lower edge everted, the ribs closely approximated or even overlapping, and the apex of the scapula tilted out as in contraction from empyema. The heart ascends in the thorax, and in one extreme case I have found it to pulsate under the second rib. All these signs are more connected with the chronic solidity than the suppuration of the lung, for the latter, by permitting some expansion to take place, may delay the process of contraction.

This condition may exist with complete dulness of sound and *bruit de pot felé*, but without the signs of cavities, or may coincide with gurgling and cavernous respiration in their different modifications.

SIGNS FROM THE STATE OF THE CIRCULATING SYSTEM.—Active organic disease of the heart and aorta being among the rarest complications in phthisis, it happens that we can seldom avail ourselves of signs drawn from the circulating system; Louis found, out of a hundred and twelve cases, only three in which the heart was enlarged. It is more often diminished in volume, pale and flabby, as if participating in the general muscular atrophy. This applies to the chronic cases, for in the acute I have often found the heart red, and in no way altered from its natural condition.*

Notwithstanding the atrophied state of the heart in phthisis, its action is occasionally violent and distressing. In most cases, indeed, its impulse is somewhat increased, and if there be emaciation, and much tubercle of the left lung, the impulse is distinctly double, the second stroke coinciding with the second sound.

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* The slowness with which the pulmonary obstruction occurs *in chronic cases*, explains the rarity of *morbus cordis*; for as Louis has remarked, the fluids diminish with the obstruction.—*Recherches sur le Phthisie Pulmonaire*. See also *Broussais' Histoire des Phlegmasies Chroniques*, tom. i.

In a few chronic apyrexial cases the heart's action is perfectly tranquil, while in a still rarer class the palpitations are violent and irregular, so as to lead to the belief of great organic disease. Of this Dr. Townsend has recorded a case, in which the symptoms were almost precisely those of morbus cordis; there were violent palpitations on exertion; a rapid, full, and bounding pulse; tremulous motion of the jugulars; extreme dyspnœa and orthopnœa; lips and nails of a dark leaden colour; and the heart's action so tumultuous, as to cause the whole anterior surface of the chest to vibrate. The heart was found perfectly well proportioned; the foramen ovale not completely closed; both lungs were extensively tubercular with intercurrent pneumonia, which had been diagnosticated before death.*

How far the open state of the foramen ovale may have influenced the symptoms in this case is still to be determined. I have seen a case of tuberculization of both lungs, where the inter-ventricular septum was deficient, the aorta arising from both ventricles; the cardiac symptoms were severe, but there was no permanent cyanosis.†

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* Transactions of the Association of the King and Queen's College of Physicians, vol. v.

† The particulars of this case were communicated by Dr. Graves to Dr. Houston; the boy, aged three years, had had frequent attacks of bronchitis, and was admitted into hospital with signs of tubercular cavities and bronchitis; the heart's action was violent, the pulse feeble, and the skin cold. The face, hands, and feet were of a dark, livid hue; *but it appeared that this colour was not habitual, and only came on when he laboured under pectoral affections.*

On dissection, besides the usual appearances of phthisis, the heart was found malformed; a well defined opening, sufficiently large to admit the little finger, led from the right ventricle through the septum into the upper part of the left; this passage was twice as wide as that leading into the pulmonary artery; the left

But one of the most interesting signs connected with the circulating system, is an increased action, often accompanied with *bruit de soufflet,* which, when the upper lobe is diseased, may be occasionally observed in the corresponding subclavian artery, and which has not been noticed by any author.

Two causes obviously exist for this increased action of the subclavian in phthisis; viz. the falling in of the subclavicular region, and the consolidation of the lung; but I have little doubt that there is a third, namely, sympathetic irritation, something similar to the sympathy of contiguity of Hunter, for I have found that in certain cases it was distinctly remittent, its appearance coinciding with signs of pulmonary excitement and irritation; *I observed it to subside after a copious hæmoptysis, and have repeatedly removed it by leeching the subclavicular or axillary regions:* and the fact of its being often accompanied by the bellows' murmur, *inaudible in any other part of the circulatory system; and, like the pulsation, capable of being modified by the antiphlogistic treatment,* leaves little doubt of the correctness of my view. Under these circumstances it occurs in cases with but little contraction or consolidation; and the bellows' sound is often exceedingly sharp, though ceasing in the brachial artery, and altogether wanting in the heart, aorta, carotid, or opposite subclavian.

Varieties of Phthisis.—Under this head we shall study the symptoms in connexion with the physical signs, of the more prominent varieties of the disease. The following cases may be enumerated.

1st. Acute inflammatory tuberculization of the lung without suppuration.

2nd. Acute suppurative tuberculization.

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auricle was small, the right large; the left ventricle of the same size and thickness as the right; the aorta was unusually capacious; and the ductus arteriosus diminished in size, but not obliterated.—*Pathological Observations, by* John Houston, M.D. *Dublin Hospital Reports,* vol. v.

3rd. Chronic progressive tubercle, with signs of local and general irritation; pulmonary ulceration.

4th. Chronic progressive ulceration succeeding to an unresolved pneumonia.

5th. Tuberculous ulceration succeeding to chronic bronchitis.

6th. Tubercle consequent on the absorption of an empyema.

7th. Chronic phthisis complicated with pneumo-thorax from fistula.

8th. Tubercle complicated with disease of the larynx.

9th. Latent progressive phthisis.

10th. Chronic, latent but partial tuberculization.

11th. Chronic general tuberculization.

12th. Cicatrization of cavities.

Acute Inflammatory Tubercle without Suppuration.—All the cases of this which I have seen, occurred as sequelæ or complications of the fever of this country. In most the symptoms supervened after the fever, an interval existing between the crisis and the new attack. In others, the disease commencing with the symptoms of the ordinary gastro-catarrhal fever, proceeded uninterruptedly to its fatal termination.

The symptoms are undistinguishable from the more violent forms of bronchitis. High inflammatory fever, with severe cough and extremely hurried respiration, sets in; the expectoration is scanty, viscid, and often tinged with blood; the face is swollen and livid, and the nares dilate, the action of the heart is violent, and the pulse extremely rapid; there are shooting pains in the side, and the patient has often copious sweatings and delirium. In some instances these symptoms are complicated with others referrible to the abdomen; the tongue is dry and red, the abdomen swollen and tender, extreme thirst, drawing up of the knees, and diarrhœa. It is singular that in a case where these symptoms were best marked we found the gastro-intestinal tube healthy, while all the parenchymatous organs were filled with granular and miliary tubercles. In another instance, peritonitis from numerous perforations had occurred, yet the abdominal were nearly masked by the thoracic symptoms.*

In a second class, the symptoms are more pneumonic, while in a third, which may be termed the hæmoptysical variety, the first symptom is a copious discharge of blood, followed by a rapid development of tubercle, but without the violent signs of irritation which occur in the two former instances.

In the two first cases the diagnosis is difficult, for the tubercle being often equably developed, comparison cannot be employed, and the want of the signs of ulceration adds to the difficulty. There is nothing characteristic in the symptoms, and the stethoscopic signs, taken alone, or considered without reference to time, are insufficient. In the first variety we have the most intense sonorous, sibilous, and muco-crepitating rales; every part of the bronchial system seems engaged. In the second the musical rales are comparatively wanting, while the crepitating and muco-crepitating are extensively audible; yet, by successive observations, and considering the phenomena with reference to time, the diagnosis can be made.

I published the first instance of this diagnosis as far back as 1828. The case was one of a young female who became attacked with violent symptoms of gastro-catarrhal fever, which resisted all means of relief. The stethoscopic signs were of intense bronchitis; yet we found that the chest became rapidly and extensively dull. This could only be explained on the supposition of an extensive crop of tubercle, which diagnosis was made at the time.

On dissection, both lungs were found completely stuffed with small granular and miliary tubercles, in such quantity as to obscure the condition of the intervening tissue, but they were generally crepitating, and no where presented complete solidity.

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* See Transactions of the Association, &c. vol. iv.; also the Clinical Report of the Meath Hospital, Dublin Hospital Reports, vol v.

This progressive general, though not complete dulness consequent on the signs of bronchitis, has led me in many cases to announce the acute general development of tubercle.*

In the second or pneumonic variety the patient, though not suffering so much from dyspnœa, is in equal danger. The musical rales are either absent or very slight; but an intense and extensive crepitating rale is to be heard. As in the former case, dulness advances, and the phenomena are only distinguishable from those of ordinary pneumonia by the absence of the signs of hepatization. The rale continues to the end, and bronchial respiration is not observed.

The third or hæmoptysical variety is never so rapid as the two former, and hence we can often avail ourselves of the signs of ulceration.

A remarkable feature in the inflammatory cases is the resistance of the symptoms and signs to treatment even of the most active and varied description. The disease seems to defy all medical treatment.

We may now state the general principle of diagnosis.

If in a case presenting the symptoms and signs of intense bronchitis, or if crepitating rale has been present, yet persisting to the last, we find the chest becoming dull; if this dulness be extensive, yet incomplete, without bronchial respiration, the stethoscope showing that the lung is everywhere permeable, the solidity only occurring in points; or if the crepitus be so slight as not to account for the dulness, we may make

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* In Dr. Clark's work this disease is noticed, and the diagnosis from percussion stated. Treatise on Pulmonary Consumption, p. 45. It is now eight years since my cases, embodying this principle of diagnosis were published.—See Transactions of the Association of the King and Queen's College of Physicians in Ireland, 1828.

the diagnosis of the acute inflammatory development of tubercle.

ACUTE SUPPURATIVE PHTHISIS.—In the preceding variety, the absence of suppuration is owing not to any inherent character of the disease, but arises simply from the rapidity of the asphyxia. The cases now under consideration are those described by Louis as the acute phthisis; one case only of the first variety is given by him.

In this affection the symptoms set in as in the former case; they continue with great violence, and resist treatment. The expectoration soon becomes purulent; the fever is high, but after a time becomes a sort of mixture of the inflammatory and hectic forms.

The stethoscopic signs of the earlier stages are the same as in the last variety, but the deep toned rales are not so often observed. After the tubercles suppurate, mucous rales passing into gurgling are heard. The musical rales, however, are not removed; a sibilous sound during inspiration and expiration is audible, and this, when the action of the heart is strong, is influenced by it so as to produce a distinct musical rhythm: of course dulness rapidly advances.

In the cases given by Louis, death occurred in three, four, five, six, and seven weeks. I have seen two cases in which no pulmonary symptoms existed before the occurrence of fever, yet in which death occurred within three weeks from the first invasion, and the lungs were found full of tuberculous anfractuosities.

Louis remarks, that notwithstanding its rapid development this disease is accompanied by those secondary lesions which we see in the more chronic forms; ulcerations of the epiglottis, trachea, œsophagus, and small intestine have been

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[*] In Louis's cases of acute phthisis, the stethoscopic indications are not sufficiently described. In some they were nothing but those of bronchitis.—*Recherches sur la Phthisie Pulmonaire.*—See Dr. Cowan's Translation.

observed. In one case he found the mucous membrane of the stomach softened and thinned; in another the liver was fatty; and in a third the lymphatic glands of the neck and mesentery contained tuberculous matter.*

The diagnosis of this affection has been in part given by Louis. By combining his observations with mine, we may state it to be the following.

If in a case which has presented violent and generally uncontrollable symptoms and signs of bronchitis, or of pneumonia continuing in its first stage; with a fever at first inflammatory, and afterwards passing into severe hectic, we find an extensive dulness to supervene, more partial, but more complete than in the preceding form, accompanied with a large mucous rale, and supervening in a few weeks from the first invasion of the disease; we may diagnosticate the acute suppurative phthisis.

In the third or hæmoptysical variety, the disease is not so rapid, nor are the signs of irritation at all so violent. There is sometimes an absence of rale, although the dulness seems as it were to grow daily, and advance downwards. The hæmoptysis seems to relieve the mucous irritation, but the tubercle advances. In this form I have observed the contraction of the chest at a very early period; it would seem as if the terminal tubes being plugged up by minute coagula, atrophy of the cells occurred long before ulceration.

CHRONIC PROGRESSIVE TUBERCLE, WITH LOCAL AND GENERAL IRRITATION, PULMONARY ULCERATION.—This is the common form of consumption, properly so called. Its symptoms have been stated so often, that their description here would be unnecessary; we shall, however, take a brief view of the symptoms and signs conjointly, in three stages of the affection; it being always understood that their combinations and characters are capable of great modification.

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* Op. cit. p. 439.

We may divide the disease into three stages; in the first the tubercle is developed, but not yet suppurated; in the second small ulcerations are formed; and in the third we have vast caverns excavating great portions of the lung. Between these stages there is no exact line of demarcation, but when established, they have each symptoms and signs which are somewhat peculiar.

First stage.—The more prominent symptoms are those of irritation; cough, pain, and quickness of pulse, which in certain cases are preceded, but in the greater majority followed, by an unaccountable emaciation; the cough is almost always dry during the first few weeks, unless where the tubercle has succeeded to catarrh; it may occur in every variety, but is most commonly a slight, frequent, and irritating cough, referred by the patient to a tickling sensation in the trachea. The expectoration, when occurring, is scanty, and consisting of a thready, greyish, and nearly transparent mucus, occasionally dotted with blood; a slight wheezing sometimes accompanies the cough.

With these symptoms the patient frequently complains of pain, which may be situated in any part of the side. In some instances it is only felt in the lower, while in others it occupies the upper part of the chest, shooting from the clavicle to the subscapular regions, and often occupying the articulation of the shoulder, when it is often mistaken for rheumatism, or the pain of hepatic disease; it occurs with various intensities, is generally remittent, and often relieved by anodyne, or slightly stimulating applications. I have known it to be regularly intermittent, coinciding with the paroxysms of hectic, so that the disease was taken for ague, and treated accordingly.* This pain is commonly accompanied with tenderness of the subclavicular region, and often with that irritation of the muscular fibres which causes their contraction on percussion; the respiration is slightly hurried, and the first approaches of hectic can be perceived.

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* The combination of pain in the shoulder with quickness of pulse, should always excite alarm.

Under these circumstances we may have one of two results from a physical examination; we shall either find that there is no sign of disease, or that some of the various phenomena of tuberculous irritation may be discovered.

In the first case the absence of physical signs has no value unless considered in relation to time; thus if the duration of the symptoms be only a few weeks, the absence of commensurate signs would be rather an argument in favour of tubercle, while if they had continued for months, and particularly if there existed any other local or constitutional cause of hectic, the absence of signs would so far justify the opinion that the disease was not pulmonary tubercle.

But in the second case the existence of any of the following signs is almost enough to reveal the too fatal disease:—

Comparative dulness of the clavicle, scapular ridge, or interscapular region.

Feebleness of respiration, most valuable when occurring on the left side, and occurring with or without puerile breathing in the other portions of the lung.

The interrupted respiration.

The various rales combined with a feeble or puerile respiration, and confined to the upper portion of the lung.

Increased resonance of the voice, most valuable on the left side.

Loudness of the sounds of the heart in the upper portions, most valuable at the right side.

The friction sound audible in the antero-superior portions.*

If we now compare the symptoms with the physical signs, we must be struck with their agreement in pointing out a progressive irritation and deposition, but without further destruction, or any supersecretion from the part.

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* As this is the rarest of the physical signs, I have placed it last in the catalogue.

Second stage.—This is characterized by the establishment of decided symptoms; the emaciation increases; the pulse continues quick; the countenance becomes characteristic; the sweatings are more profuse; the cough looser, the expectoration becoming puriform, tubercular, and often bloody. The digestive system now begins to suffer; thirst, loss of appetite, and abdominal pains torment the patient, and the first indications of the wasting and persistent diarrhœa appear; the patient feels that he can lie better on one side than the other, and begins to feel pain in the opposite side of the chest, a sure sign that his terrible disease has invaded the remaining lung.*

The physical signs are the following:—

Increase and extension downwards of the dulness on percussion.

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* Notwithstanding all this, it will commonly be found that this is the period at which the patient seems to feel the greatest relief, and shows the greatest confidence in recovery; two causes seem to concur towards this result; the first, that the gastro-intestinal disease acts as a revulsive, and relieves the pulmonary irritation to a certain degree, as in the case of fistula in ano, and we have a painless but yet revulsive discharge.

In the next place, the pulmonary irritation is relieved to a certain degree by the secretion of pus from the ulcers and bronchial tubes, and thus if no new inflammatory crop of tubercle is developing a period of comparative ease is produced.

But there is a third and mechanical cause to be noticed; according as the suppuration of the tubercles extends, and the excavations enlarge, the cough often becomes much less frequent and troublesome; it no longer occurs in fits, but singly, followed by the easy expectoration of a mass of muco-puriform and tuberculous matter; this is treaceable to the free bronchial communication with the ulcerous cavities. The destruction of the lung causes a relief to the patient, and too often may we hear the voice of hope and confidence, reverberating in the cavity which seals the patient's doom.

The respiratory murmur is feeble or changed into a semi-tracheal breathing, most audible in the erect position. This is often combined with deep seated or superficial cavernous breathing; the *bruit de soupape* and cavernous rales. When the ulcerations are small and numerous, the cavernous phenomena are indistinct; and dulness of sound, with a large mucous rale, increased by coughing, and a semi-tracheal breathing, are the principal signs.

When the cavities are sufficiently large, some form of pectoriloquism may occur; but most commonly there is nothing but an increased and undefined resonance of the voice. These signs are most distinct in the postero-superior portions.

All varieties of the crepitating, mucous, and cavernous rales occur, the size of the bubbles generally diminishing from above downwards; and in certain cases the rales are modified by the action of the heart, or occasionally suspended by bronchial obstruction.

The respiration in the lower lobe, or opposite lung, is puerile; and we have the signs of atrophy, evident generally in proportion to the chronicity of the case.

Third stage.—In this condition the patient is often apyrexial, and the perspirations cease, particularly if the digestive system remains healthy: the pulse may be slow, though generally becoming again accelerated before death: emaciation proceeeds to the last extremity. The voice is sometimes lost; at others hollow and melancholy: the cough is loose; the respiration tranquil; and expectoration easy: apthæ appear on the tongue, and spread over the cavity of the mouth: the limbs become cold: the breath gets a heavy odour, and the appetite in general fails. Yet the painful tenacity of life continues for a length of time, as if the patient wanted strength to die. The physical signs of this condition are so graphically described by Dr. Clark, that I cannot do better than give them in his own words.

"The chest, at this advanced period of the disease, is found to be remarkably changed in its form; it is flat, instead of being round and prominent: the shoulders are round, and brought forward: and the clavicles are unusually prominent, leaving a deep hollow space between them and the upper ribs. The subclavicular regions are nearly immoveable during respiration; and when the patient attempts to make a full inspiration, the upper part of the thorax, instead of expanding with the spontaneous ease peculiar to health, seems to be forcibly dragged upwards. Percussion gives a dull sound over the superior parts of the chest, although the caverns which partially occupy this part of the lungs, and the emaciated state of the parietes, may render the sound less dull than in the preceding stage. The stethoscope affords more certain signs, the respiration is obscure, and in some places inaudible; while in others it is particularly clear, but has the character of the bronchial, or tracheal, or even cavernous respiration of Laennec. There is a mucous rhonchus; coughing gives rise to a gurgling sound (*gargouillement*); and pectoriloquism is generally more or less distinct, for the most part on both sides, though more marked on one than the other. In this state the patient may still linger for weeks, or even months, reduced almost to a skeleton, and scarcely able to move, in consequence of debility and dyspnœa."*

To this succinct but lucid description there is but little to be added. When the cavities are large, there is often an absence of pectoriloquism; and the cavernous respiration, whether from the size of the cavern or the feebleness of breathing, becomes often indistinct, and as it were distant. It is at this period that the metallic phenomena are generally audible, while the respiratory murmur which had been puerile in the healthier portions of the lung, at length loses this character.

Chronic Tuberculous Ulceration, succeeding to an unresolved Pneumonia.—In this case the progress of the tubercle is insidious ; and where the seat of pneumonia has been in the lower tube, it is reversed, beginning below and proceeding upwards. Tubercle may supervene in the sthenic or asthenic pneumonia, but much more frequently on the latter. Independent, however, of any constitutional tendencies, there are three cases in which this termination may be observed,—the first in which a sthenic pneumonia has been neglected, or exasperated in its early stage ; the second, a case in which auscultation has not been employed, and the disease only rendered latent by treatment ; and the third, the typhoid variety, when the strength is profoundly injured.

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* Treatise on Pulmonary Consumption. London: 1835.

In such cases the lung remains solid, or we may observe attempts at resolution to occur more than once. A considerable portion of the lung may resolve, yet the process be arrested, and one part continue dull on percussion.

Under these circumstances, the patient seems, for an indefinite period, in a state of imperfect convalescence : his pulse may have become slow, but it begins to rise : he does not gain flesh ; some cough remains ; obscure fever manifests itself ; the breathing becomes hurried ; and by degrees the usual symptoms appear : and he generally sinks in from three to six months from the first attack of pneumonia.

When the lower lobe is engaged, the physical signs are the following :—

Hepatization continuing for about a month, we find a mucous rattle generally near to the root of the lung : the respiration of the upper lobe, which had been puerile, gradually becomes feebler, from below upwards, either without rale or with a few mucous or muco-crepitating bubbles: every day we observe the dulness to advance ; the bubbles at the root of the lung become larger, and ultimately a cavity appears : then the ulcerative process stretches upwards, and new excavations appear in various portions.

When the upper lobe has been engaged, the same circumstances occur ; and vacillations in resolution may be observed even after ulcerations have formed. After middle age, the process is extremely slow, and may coincide with a singularly tranquil state of the heart.

TUBERCLE CONSEQUENT ON A CHRONIC BRONCHITIS.—This combination is much more frequent than has been supposed: a great number of cases, called bronchitis, occurring after the meridian of life, are of this nature.

The cases may be divided into two classes, according to the expectoration. In the first it has been for years concocted, or muco-puriform. In the second, it consists of a scanty serous, or sero-mucous fluid. Tubercle may supervene in both cases, but is more common in the first than the second form.

In the first case, a chronic catarrh having existed for many months or years, passes insidiously into phthisis: or, what is more common, a peculiar change of symptoms marks the commencement of the tuberculous disease. A patient shall have had cough and expectoration for three or four years, yet preserving his flesh and appearance, and with a quiet pulse. He may then be attacked with hæmoptysis; his pulse becomes quickened, and emaciation advances slowly, and he by slow degrees passes into phthisis: or a tubercular complication may supervene, without any apparent change in symptoms. The pulse may continue tranquil, and hectic be absent; and the disease be only detected by physical signs.

It is in these cases, but particularly the last, that we observe the extreme chronicity of phthisis. It may be advancing from five to fourteen years, or even longer; a fact to be explained, in part at least, by the copious expectoration which acts as an issue, and the healthy state of the digestive system. To these must be added the important condition stated by Dr. Clark, of the absence of constitutional disposition, rendering the progress of disease slower.* In some instances, the disease advances steadily, and almost imperceptibly; while in others there are frequent exacerbations with hæmoptysis, and great increase of dyspnœa and expectoration.

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* Op. cit. p. 52.

I have no observations to illustrate the early stages of the transition from bronchitis to phthisis. In all cases which I have seen, the disease was local, and comparison could be employed. We may then apply the diagnostics as in the third variety. Dulness and signs of anfractuosities are found, and the diagnosis will lie between dilated tubes and phthisical ulcerations. The progression of the signs, the rale, and the absence of the bronchial respiration, and resonance of the voice as in dilated tubes, will in general suffice for diagnosis. Of these principles, the first is the most important. In some advanced cases, great deformity is produced by the contraction of the chest.

TUBERCULIZATION OF THE LUNG, CONSEQUENT ON THE ABSORPTION OF AN EMPYEMA.—We may suspect this occurrence in all cases where, after the absorption of an empyema, the cough is renewed, and the pulse becomes permanently accelerated. In neglected cases, yet in which absorption occurs, independent, or nearly so, of treatment, it is a common termination. In a few instances an interval of quiescence intervenes between the subsidence of the first and the commencement of the second disease: while in others, the phthisical symptoms and signs supervene immediately on the removal of the effusion. Without possessing a sufficient number of cases to determine the point, I would say that the rapid absorptions are more likely to be followed by a fatal development of tubercle than those more chronic. And it may be inquired, whether the "*doubtful convalescence*" of Laennec is not often produced by the formation and evacuation of a small quantity of this consecutive tubercle. I have often, in such instances, been kept in a state of great apprehension, by the recurrence of rale and feeble respiration several times in the upper portion of the lung. In two cases I found that although tubercle existed in both lungs, it was in much greater quantity in the side opposite to that where the pleurisy had occurred, as if the pressure had diminished the liability to tubercle. It is a curious fact, but not without analogies, that the occurrence of an empyema and pneumo-thorax from fistula, suspends the progress of tubercle in a remarkable manner.

The physical diagnosis is often difficult from our inability to apply comparison. The pleurisy has altered the symmetry of the chest, and has caused physical phenomena, depending on the contraction : hence in the earlier periods, the dulness and feebleness of respiration may not be tubercular, and may even occur on the side where least tubercle exists. This I have more than once verified: but when with the symptoms of a new pulmonary disease, with hectic, and a quickened pulse, we find the opposite clavicle or scapular ridge becoming dull, and with some of the active signs of irritation, we may diagnosticate tubercle. When the disease, however, predominates in the affected lung, a curious change of phenomena is observed : the dulness and feebleness of respiration, as it were, change seats, and in place of existing inferiorly, are perceived in the upper portion, while the lower becomes not really clearer than it was, but comparatively so.

But tubercle may supervene, even although the empyema is not absorbed. The opposite lung is then the seat of disease, which may pass into ulceration. In this way large cavities may exist in one lung, with an original empyema of the other. In some of these cases the puerile respiration of the tuberculous lung is beyond every thing intense, so that a large cavity may exist, yet without our being able to detect either the cavernous respiration or gurgling. This must be borne in mind, in all examinations of the lung, previous to the operation for empyema.

In more chronic cases, however, with great emaciation, and less puerility of breathing, the progress of tubercle in the opposite lung can be easily recognized by the usual signs.

PHTHISIS COMPLICATED WITH EMPYEMA AND PNEUMOTHORAX

FROM FISTULA.—I shall not enter here into the history of this triple lesion, but remark, in the first place, on the interesting fact, that the proper symptoms of phthisis are in many cases arrested, and singularly modified, by the occurrence of the new disease. I have often found that after the first violent symptoms had subsided, the hectic ceased, the phthisical expression disappeared, the flesh and strength returned; and in this way the patient has enjoyed many months of comfortable existence, and was only disturbed by dyspnœa and the sound of fluctuation on exercise.

To explain this, we must recollect the compression exercised on the lung, which by diminishing its vascular supply, causes its atrophy, and arrests its disease. The pleuritis too, may have a revulsive effect; and perhaps the increased action of the opposite lung, by preventing the obliteration of the minute tubes, may hinder the accumulation of tubercle.

In chronic cases, where the lung is, as it were, anchored to the parietes of the chest by adhesions, the cavity from which the fistula has passed can be easily detected. With respect to the opposite lung, there is nothing to interfere with direct diagnosis, unless it be the puerility of respiration. Under the circumstances, however, any sign of irritation of the opposite lung is sufficient to point out tubercle.

PHTHISIS, COMPLICATED WITH LARYNGEAL DISEASE.—I have already stated the frequent combination of ulceration of the larynx with tubercle of the lung.* The common case of phthisis laryngea is in most instances pulmonary consumption, with ulcerations of the larynx, either preceding or following the tubercular disease.

With respect to diagnosis, the early history must be examined, so as to discover whether pulmonary as well as laryngeal disease exists. If there have been cough, pain of the chest or shoulder, hæmoptysis, difficulty of lying on one side, copious expectoration, any degree of emaciation, quickness of pulse, or hectic fever before the laryngeal symptoms, there is the greatest probability of tubercle existing; or if these symptoms distinctly supervened on the laryngeal affection, forming a new train of sufferings, the same conclusion may be come to. Many cases also will be found to have commenced by an influenza, a bronchitis, or pneumonia—in all of which the complication commonly exists.

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* See the Section on Diseases of the Larynx and Trachea.

The physical diagnosis is in general easy, except in old persons, or when great stridor exists. A certain degree of stridor does not prevent a stethoscopic examination; and when the obstruction is great, (a rare case,) we can use percussion and measurement. In most cases the tubercle predominates on one side, and comparison can be employed.

Acute affections of the larynx are rare in phthisis. The following case presents symptoms which are somewhat difficult of explanation:—

A gentleman in the last stage of chronic phthisis, with dulness of the upper lobe of the left lung, and the signs of a cavity under the clavicle, was suddenly seized with dreadful dyspnœa, followed by a slight convulsive fit. The respiration was tracheal, but the obstruction seemed to be low down. In this state he continued for twenty-four hours, with occasional slight remissions. The difficulty of breathing then increased so much that the opening of the trachea was contemplated as a means of temporary relief. The operation, however, was not performed. Next morning the symptoms being somewhat relieved by a blister and other treatment, I was enabled to make an examination. The right lung sounded every where clear, but respiration was unusually feeble; while the left, which before presented feeble respiration and the signs of a cavity, now gave the most intense puerile murmur, masking the cavernous signs. In fact the phenomena of the chest were completely reversed. By degrees the tracheal breathing subsided; the signs of a cavity returned; the right lung expanded as before, but a general bronchial rale preceded death for a few days.

These phenomena can only be explained by the temporary obstruction of the right bronchus.

CHRONIC LATENT FORMS.—CICATRIZATION OF CAVITIES.—I shall not dwell at any length on the remaining varieties of phthisis. Like other diseases, pulmonary tubercle is occasionally a latent disease; but I have never known it latent when considered as to local symptoms, general symptoms and physical signs, combined. The first may be wanting, the second absent or anomalous, and the physical signs obscure; but by combining all the phenomena the disease can be detected in almost every case. What has been already said is sufficient to guide the diagnosis* in most cases of the senile phthisis.

On the signs of cicatrization I have nothing to add to what has been already stated by Laennec. A certain feebleness of respiration, a little dulness of sound, and a somewhat tracheal character of the vesicular murmur are the phenomena commonly observed.

In the examination of a patient supposed to be phthisical, the following points demand attention before proceeding to the physical signs:—

1st. The age, habit, and diathesis of the patient, and whether phthisis or scrofula have existed in his family.

2nd. The exact date of his illness.

3rd. Whether this has been the first attack, and how far he has been liable to bronchitis.

4th. Whether the disease commenced by laryngeal, tracheal, or bronchial irritation, or followed a pneumonia, a pleurisy, or a continued fever.

5th. Whether there has been hæmoptysis, and if so, its nature, repetitions, and whether it preceded or followed the other pulmonary symptoms.

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* See page 402.

6th. Whether the cough was at first dry or followed by expectoration.

7th. The nature and quantity of expectoration, and whether there has been a change from a mucous to a purulent character, coinciding with the symptoms of ulceration; whether any calculous matter has been expectorated.

8th. Whether there has been pain; if so, its seat and nature; whether it has affected the shoulder, side, or calf of the leg.

9th. The existence of hectic, emaciation, and acceleration of breathing; the state of the pulse, and decubitus.

10th. The condition of the digestive system.

11th. The state of the pharynx, larynx, and trachea.

12th. Whether there be any syphilitic taint; if so, examine for periostitis of the chest.*

13th. Whether the patient (if a female) be hysterical:† the state of the uterine system.

14th. Whether if there has been any external disease of a scrofulous nature, the symptoms have succeeded to its removal or diminution.

With the information thus obtained we may proceed to the physical examination, which must be conducted in as delicate and rapid mode as possible. It is almost never necessary to uncover the whole chest, the baring of the upper portion is sufficient. Before percussion, gentle pressure should be made on the sub-clavicular regions, to discover whether any tenderness exists, which would render its use painful. Percussion must then be performed, the patient being in the erect position, and without the head being inclined to either side. It is always to be comparative and strictly so, and we get much better results by the most delicate than by forcible percussion. The best pleximeter is the index finger, the back of which is laid on the chest. In this way the clavicles, sub-clavicular regions, and ridges of the scapulæ are to be explored. If necessary, we may use percussion at the end of a forced inspiration, and compare the sound of the upper and lower portions. For the active signs the stethoscope is absolutely necessary, for the results of immediate auscultation are not sufficiently accurate; the respiration, cough, voice, and sounds of the heart, are to be explored rapidly; and an observation being made of the external appearance of the chest as to contraction, the examination is completed.

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* Secondary syphilis simulates phthisis when the syphilitic hectic exists with the bronchial irritation which I have described. If, as is often the case, there be also periostitis of the ribs or sternum, the symptoms are almost identical.

† The practitioner must not build too much on the complication with hysteria. Nothing is more common than to attribute the symptoms of tubercle to this affection: an error injurious to the patient and to the reputation of the physician. The complication of the hysterical cough with fever should always excite alarm. In phthisis, if there be any any cause for spasmodic cough, this character often continues to the end. Thus where tubercle succeeds to pertussis, the original character of cough may continue long after great cavities are formed. There is, however, a singular hysterical affection with violent cough and hæmoptysis, excitement of the pulse and respiration, and copious sweatings. The respiration is intensely puerile; but though the symptoms continue for months defying all treatment, there are no signs of consolidation.

In the nervous female, and in cases in which there has been recent hæmoptysis, the examination must be performed as expeditiously as possible; and in the latter case, all fatigue to the patient, and forced inspirations are to be avoided, lest a new hæmorrhage should be induced.

Before considering the treatment, we shall recapitulate the facts of the physical diagnosis. Of course many of these have been already observed by authors.

1st. That there are no physical signs peculiar to tubercle.

2nd. That every known auscultatory sign, active or passive, may be met with in phthisis.

3rd. That in the great majority of cases comparison can be used, in consequence of the predominance of disease in one portion of the lung.

4th. That where comparison cannot be employed, there is much greater difficulty of diagnosis.

5th. That the earliest and consequently most important signs, are in the great majority of cases, those of irritation.

6th. That these may exist in any of the tissues of the lung.

7th. That the bronchitic signs derive their value principally from their localization and combination with dulness on percussion.

8th. That the crepitating rale of pneumonia is rarely observed in the portion of the lung first tuberculated.

9th. That when it occurs it is either recurrent, or continued, and in the latter case it persists much longer than in ordinary pneumonia.

10th. That feebleness of respiration is one of the most common physical signs.

11th. That though commonly combined with other signs it may occur as the sole phenomenon.

12th. That the interrupted respiration receives its value solely from its localization, and co-existence with other signs.

13th. That of the signs of irritation, those of the serous membrane are the rarest.

14th. That complete solidity of the lung is rare in phthisis.

15th. That in the early stages it can often only be ascertained by comparison ; it proceeds from above downwards, and may exist with a feeble or puerile respiration.

16th. That perfect tracheal respiration is rare in phthisis.

17th. That when it exists it is most evident in the erect position.

18th. That one side is rarely observed to be equally dull.

19th. That the formation of cavities gives a tympanitic character to the sound on percussion.

20th. That in cases of solidity of the left lung, a somewhat similar character is given by the distention of the stomach with air.

21st. That in the universal development of tubercle, the sound is generally but not completely dull.

22nd. That a great quantity of tubercle, when equally diffused, may coincide with but little dulness on percussion.

23rd. That in ordinary phthisis the greatest variety may exist as to dulness.

24th. That the signs of irritation, and of solidification in its early stages, may be modified or even removed by an antiphlogistic or revulsive treatment.

25th. That in the early stages of the case, these phenomena only shew that tubercle is about to form.

26th. That the signs of ulceration may imperceptibly succeed those of irritation, or appear at once.

27th. That they rarely exist without the signs of the earlier stages of tubercle in other parts of the lung.

28th. That they may be temporarily obscured by obstruction of their bronchial communications.

29th. That they are not audible to any distance beyond their actual situation.

30th. That the action of the heart may produce an audible agitation of the fluid contents of a cavity.

31st. That the metallic phenomena are generally perceived when the cavity is large, but may occur from several small but inter-communicating ulcerations, and may be absent even in very large cavities.

32nd. That atrophy of the lung causes contraction of the chest at an early period, and independent of the formation of cavities.

33rd. That in very chronic cases it may produce a deformity greater than what occurs from the cure of empyema.

34th. That the action of the heart seldom furnishes signs of value in phthisis.

35th. That in cases of tubercular deposit in the upper portion of the right lung, the sounds of the heart are often heard more loudly in this situation than under the left clavicle.*

36th. That in certain cases the sounds of the heart and those produced by its impulses on the diseased lung, cause a distinct rythm.

37th. That in cases of extreme atrophy of the upper lobe of the lung, the heart ascends high in the thorax.

38th. That the subclavian artery corresponding to the affected side, occasionally presents an increased pulsation with *bruit de soufflet,* which can only be explained by some sympathetic irritation of the vessel.

39th. That the supervention of dulness, with the stethoscopic signs of bronchitis, indicates tubercle.

40th. That in this way we may discover tubercle in cases not localized, and consequently not admitting of comparison.

41st. That the crepitating rale of acute phthisis is not succeeded by signs of hepatization, as in pneumonia.

42nd. That the dulness of the acute suppurative phthisis is greater than in the non-suppurative cases.

43rd. That in the hæmoptysical variety of acute phthisis, there is often a want of proportion between the signs of solidification, and those of pulmonary irritation. The first being well marked, and the latter comparatively wanting.

44th. That in the ordinary progressive phthisis, the physical signs accurately correspond with the successive changes.

45th. That where tubercle succeeds to an unresolved pneumonia of the lower lobe, there are, co-incident with the signs of softening in the unresolved portion, evidences of the spreading upwards of condensation.

46th. That the supervention of dulness in a case of chronic bronchitis, followed by the signs of anfractuosities, points out that tubercle is developed.†

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* This observation was accidentally omitted in the account of the signs derivable from the circulating system.

† Here it is necessary to observe, that in certain cases of bronchitis, where the

47th. That where the expectoration is scanty, and the disease very chronic, the occurrence of dilated cells may obscure the signs of tubercle.

48th. That where anfractuosities form, we may distinguish them from dilated tubes, by the dulness which has preceded them, by the signs of their extension,* and by reference to time.

49th. That the discovery of tubercle, in cases of absorbed empyema, is often difficult from the condition of the lungs having been altered.

50th. That where a great empyema exists, the intensity of the puerile respiration in the opposite lung may obscure the signs of disease of its substance.

51st. That in cases with empyema with pneumo-thorax, where adhesions prevent the collapse of the lung, the original cavity may be still detected.

52nd. That in this complication, the signs of irritation of the opposite lung are almost always indicative of tubercle.

53rd. That in the laryngeal complication, the physical diagnosis is in general easy, unless where great stridor exists.

TREATMENT OF PHTHISIS.

We may consider this treatment under two heads, viz.—the

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minute tubes are engaged, and with profuse puriform expectoration, the lodgment of the secretion causes occasionally a dulness of sound. But this cannot be confounded with that of tubercle, for it almost always occurs in the lower portions, is constantly varying, and may be removed (for a time) by an emetic, or a blister. I have only seen one case in which this lodgment caused a temporary dulness of the upper lobe. It was evident in the morning, but disappeared in a few hours, leaving the respiratory murmur natural.

* When I wrote the article on dilatation of the tubes, I was not aware that Dr. Williams had already stated the differential diagnosis between this disease and tubercular cavities, as drawn from the signs of extension.—*Rational Exposition of the Signs of Diseases of the Lung and Pleura*, also *Encyclopædia of Practical Medicine*, Art. *Bronchitis*.

curative and the palliative: the first, the attempt to eradicate the disease by active treatment; the second, the relieving the various distressing symptoms of a hopeless consumption. And however differing in detail, the principle of both methods is the same, namely, the removal of irritation from the lung, and the improvement of the general health.

It unfortunately happens that the palliative treatment is that which we must generally follow; but there can be no doubt that as medicine advances, the cures of consumption will be much more frequent; its nature will be better understood, its first stages more commonly recognized, and the disease prevented from proceeding to incurable disorganization.

The first, the most important point in preparing ourselves for the successful treatment of phthisis, is to have clear notions as to its connexion with irritation.

Without adopting the opinion of Broussais, that phthisis is nothing but a chronic pneumonia,* but rather holding with Andral, Carswell, Forbes, and Clark, that the tubercular matter results from a lesion of secretion, we must admit its connexion with a state of irritation in most cases. There are some, indeed, where the matter seems deposited without any such action, but these are comparatively rare.

Before entering on this subject, I shall state the division of cases of phthisis which I have generally followed with relation to treatment. They may be separated into two classes, the constitutional and accidental phthisis. In the first, tubercle supervenes either with or without precursory irritation, in persons strongly predisposed to it by hereditary disposition or original conformation. In these the disease is generally rapid, invades both lungs, and is complicated with lesions of other systems. The disease is constitutional, and the affection of the lung, though the first perceived, seems but a link in the chain of morbid actions.

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* Histoire des Phlegmasies Chroniques, vol. ii. See also his Commentaires sur les Propositions de Pathologie.

In the second, we meet the disease in persons not of the strumous diathesis, and who have no hereditary disposition to tubercle. The disease results from a distinct local pulmonary irritation, advances slowly, and the digestive and other systems show a great immunity from disease.

In both cases we may effect a cure; but this result will be more often obtained in the latter than in the former class. The value of early treatment is of course greater in the constitutional than the accidental case. In the early stages of the constitutional disease, recovery is only to be effected by treatment; in the advanced cases, when it does occur, it seems almost independent of treatment.

In the accidental phthisis, the lesser tendency to abdominal and other complication, allows time for the vital powers to act; while in the constitutional variety, tubercle is commonly deposited throughout the body, and the patient dies rapidly in consequence of such extent of disease.

But to return to the connexion with irritation, we find it in the great majority of cases to precede, accompany, and accelerate the disease; and further, that within certain limits, it is by removing irritation that we best succeed in effecting a cure. Without this principle we have no key to the treatment of phthisis. Tubercle is preceded by irritation. This is seen in the history of almost every case; an ordinary cold, an attack of influenza, a pneumonia, a pleurisy, the bronchial irritation of hooping cough, or the exanthemata—these admitted conditions of irritation are commonly the first links in the chain of consumptive symptoms. How commonly in the strumous diathesis do we see individuals continuing free from phthisis for many years, till an attack of pulmonary irritation occurs, and then we can trace the first growth, and progress of tubercle. And, if further evidence is necessary, let us recollect the effect of injuries of the chest, and the phenomena of the acute inflammatory tubercle.

That tubercle is accompanied by irritation hardly demands proof. Fever, cough, excitement of the lung, and acute pain, declare the inward disease. Or if we turn to anatomy, we find actual inflammation of the tissues of the lung, redness, thickening, softening, and ulceration of the mucous membrane, purulent secretions, vermilion redness of the inter-tubercular tissue, solidification of the lung, and lymph on the pleura. Finally, it is not uncommon to see the patient suddenly cut off by some violent inflammation, pneumonia, pleurisy, cerebritis, or enteritis.

But tubercle is not only preceded and accompanied by irritation, but it is hastened by it. Every new attack of irritation is followed by increase of the tubercular symptoms, unless it be of the surface, when a revulsive action, proving the general proposition, is occasionally seen.

Lastly, experience shews, that it is by means calculated to diminish irritation of the lung at the least expense to the constitution, that we can best palliate or delay the progress of phthisis; and I trust to be able to show that the antiphlogistic treatment is the true mode of arresting the disease in its early periods.

Thus the proposition is proved by the study of symptoms, by the results of anatomy, and by the experience of treatment. It is hardly necessary to repeat that there are cases of extensive tubercular formation, in which irritation is either absent, or but little marked. These are always incurable, happily they are rare.

On being called to a case of phthisis, the practitioner has to decide whether to adopt the curative or palliative treatment. The following are the circumstances which may induce him to attempt the cure.

1st. The absence of the strumous diathesis, or an hereditary disposition.

2nd. The fact of the disease being recent, for *where physical* *signs of tubercle exist*, the chance of recovery is inversely as the duration of symptoms.

3rd. The want of proportion between the extent of disease as indicated by physical signs, and the duration of symptoms. If the extent be slight, although symptoms have existed for months, it shows a power of resistance in the economy.

4th. The calmness of the pulse.

5th. The absence, or slight degree of emaciation or hectic.

6th. The healthy state of the digestive system.*

7th. The fact of the disease having distinctly supervened on a pneumonia or bronchitis.

8th. The occurrence of free expectoration from the first period of the cough.†

9th. The healthy state of the larynx.‡

10th. The disease, as shown by physical signs, being confined to one lung, and to a small portion of that lung.

11th. The absence of the signs of cavities.§

12th. The absence of puerile respiration in the healthy portions of the lung.||

13th. The absence of the signs of atrophy.

It is not meant that a case should present all these characters in order to justify our hopes and attempts of cure: any of them are of value. Of course the more of them present

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* In all the extremely chronic cases which I have observed, the digestive system continued healthy, and I have never heard of a recovery after diarrhœa had occurred.

† An important character, as showing an early attempt to relieve the irritation by secretion.

‡ Most important. The combination of even a small quantity of pulmonary tubercle, in laryngeal disease, is always fatal.

§ This requires explanation. We know that recovery happens after the formation of cavities, but in most cases their existence implies that of tubercle in great quantity, occupying other portions of the lung.

|| This character is of value as showing that a small part of the lung is obliterated, and indicating a quiescent state of the other portions.

the better; and, excluding the first character, they may be all available in any case of phthisis, whether constitutional or not.

Incipient curable phthisis is met with in one of three forms, which may be designated as the Localized Bronchitic, the Tracheal, the Hæmoptysical, and the Pneumonic varieties. We shall discuss the treatment of these separately.

LOCALIZED BRONCHITIC VARIETY.—This is shown by the existence of the signs of bronchial irritation already described. They occur in the upper portion, are combined with vesicular murmur, and with slight dulness. The pulse is quickened, the cough is generally dry, but the hectic is not yet confirmed, nor is emaciation decided.

At this stage the experience of a great number of cases enables me to say that a cure can be performed. This is the period for exertion on the part of the physician, but that in which precious time is commonly lost.

There is a local irritation to be subdued; tubercle may or may not have formed. In the first case its quantity is so small, that nature often is able to throw it off; in the second case, it is threatened, and every day, by promoting irritation, increases the chance of its deposition.

The patient must be confined to his room, and all exertions of the lung forbidden. If he be of a robust habit, and that the pulse is inflammatory, a single bleeding from the arm is to be performed; the bowels must be kept gently open, and the diet consist of milk, farinaceous substances, and light vegetables.

Leeches are to be applied in small numbers alternately to the sub-clavicular and axillary regions of the affected side. This depletion is to be repeatedly performed, the cupping-glass being occasionally used over the bites. Under this treatment the rale will be commonly removed, the vesicular murmur increased in strength, and the dulness diminished, and all this with corresponding relief to the symptoms. We are now to commence the use of blisters, which are to be continually applied under the clavicle and over the scapular ridge. Their size should not exceed that of a dollar, and they must in all cases be covered with silver paper. A blister is to be applied about every three days. This counter-irritation is to be persevered in for several weeks, when the blister under the clavicle may be converted into a superficial issue, by dressing the surface with a disc of felt, and a combination of mercurial and savine ointments. During this treatment the cough is to be allayed by mild sedatives.*

As soon as the issue is established, the regimen may be improved. The patient may now commence the friction with the turpentine liniment,† and if necessary, use inhalations of the vapour of water, impregnated with a narcotic extract. From twelve to fifteen grains of the extract of cicuta may be employed, at each time of inhalation. In mild weather, horse exercise should be taken, and the invalid, to perfect his recovery should remove to a milder climate, and frequently change his situation.

Such is the treatment of the most common form of incipient consumption. We owe the principle of local depletion to Broussais, and among the many boons which he has conferred on practical medicine, there is none greater than this. On this subject I shall quote two of his propositions.

"*Les sangsues placées à la partie inférieure du cou, entre les insertions des muscles sterno-mastoïdiens, enlèvent le catarrhe bronchique et préviennent la phthisie pulmonaire.*

"*Les sangsues placées autour des clavicules et sous les aisselles arrêtent les progrès d'un catarrhe qui vient de s'introduire dans le lobe supérieur et qui aurait infailliblement produit la phthisie pulmonaire. Un son mat ou moins clair, tout*

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* The following is the formula which I employ at this stage:—R. Mucilaginis Arab. vel Tragacanth. ℥iii.; Syrup. Limon. ℥ss.; Aq. puræ, ℥iiss.; Aq. Lauro-Cerasi, ʒss.—ʒi.; Acetatis Morphiæ, gr. i. This can be permanently used without deranging the stomach.

† The formula for this has been given in the chapter on Bronchitis.

récent, annonce que le catarrhe a pénétré dans le parenchyme, et indique qu'il faut insister sur les saignées locales."*

INCIPIENT TRACHEAL IRRITATION.—A person of a strumous habit, some of the members of whose family have been cut off by phthisis, which set in with symptoms precisely similar to his, is attacked, after exposure to cold, with a loud ringing cough, occurring in distressing and uncontrollable paroxysms. He has pain and soreness of the windpipe, loses flesh, and is feverish at night. There is frequently pain of the chest and shoulder, and some acceleration of breathing. The pharynx is healthy, or only slightly vascular. On percussion both lungs sound well and equally, and the respiratory murmur is every where audible.

The treatment in this case must be active and decided, for if neglected the disease runs into the miserable complication of pulmonary tubercle with laryngeal ulceration.

The patient must be confined to bed, or to a warm room, and placed on a milk diet; all exertions of the voice are to be prohibited. Leeches are to be applied daily to the windpipe, beginning with from eight to ten, and diminishing the number for four or five days; blisters may then be applied to the nape of the neck and sternum.

But these remedies, though successful in a few cases, may fail unless we adopt the mercurial treatment first recommended by Mr. Porter in sub-acute laryngitis. By the use of mild but frequently repeated doses of the ordinary mercurials, in combination with opium, we are to affect the gums gently, but decidedly; when it will commonly happen that all tracheal and pulmonary irritation shall subside.

Thus by the use of mercury we prevent the development of tubercle. This brings us to the important subject of the mercurial treatment of incipient phthisis. Before entering on it, however, we shall notice the two remaining cases for treatment.

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* Examen des Doctrines Medicales, vol. i.; Propositions de Medecine, prop. cclxxii.—cclxxiii. See also his Commentaires sur les Propositions de Pathologie.

HÆMOPTYSICAL VARIETY.—An individual in perfect health, or labouring perhaps under a slight cold, is attacked with copious hæmoptysis, accompanied with great excitement of the heart. The hæmorrhage having nearly subsided, we find the breathing and circulation quick; cough continues, and there may be local pain. The upper portion of one side sounds dull, and here the respiration is decidedly feeble, although generally with little rale.*

In these cases the tubercular development is often astonishingly rapid, no interval occurring from the first invasion. In a few, however, there is an interval of calm between the cessation of the hæmorrhage and the phthisical symptoms.

For controlling the hæmoptysis the best treatment is general, followed at once by local or revulsive bleeding. Guided by the stethoscope, we apply a great number of leeches over the affected part, and repeat this treatment frequently. In a few cases I have seen leeching the feet, followed by the pediluvium, to have an excellent effect; but it is decidedly inferior to local bleeding. It is always better to control the bleeding in this way than by direct astringents; if, however, we must have recourse to these remedies, we may employ the acetate of lead in full doses, combined with opium, and a little excess of acetic acid, or we may use the sulphuric acid and alum. I have never applied cold to the chest. The patient is to be kept perfectly at rest, and all unnecessary examinations avoided.

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* This interesting fact has been already alluded to. The absence of rale probably proceeds from the obstruction of the minute tubes by coagula. In a case of pulmonary apoplexy, I found every tube that could be traced, plugged up by a bloody coagulum. But in certain cases of the strongly marked strumous diathesis we see a rapid advance of tubercle without the stethoscopic signs of mucous irritation, particularly when repeated bleedings have been performed.

Dr. Cheyne has given the weight of his testimony strongly in favour of bleeding in the hæmoptysical variety of phthisis, and in cases of bronchial hæmorrhage threatening consumption, he recommends small bleedings at intervals of a week. He considers bleeding to be justified during hæmoptysis, or any symptom or sign of inflammation. In such cases he exhibits tartar emetic in nauseating doses, or the combination of one-fourth of a grain of tartar emetic with ten or fifteen grains of nitre, a combination in which he places great confidence.* In such cases I have not used emetics, from a dread of their increasing hæmorrhage. I have seen death to occur in a case of hæmoptysis, in consequence of an enormous eruption of blood after vomiting, induced by a very small portion of tartar emetic.

The hæmorrhage being controlled, the indication is to restore the lung to health as speedily as possible. All the means pointed out in the treatment of the first variety are to be used, but with greater activity. I shall presently notice a case in which mercury was employed.†

Pneumonic Variety.—This has been already alluded to when describing the succession of tubercle to an unresolved pneumonia. But the case of pneumonia occurring in a strumous habit, and particularly when engaging the upper lobe, may be arranged under the same head. In this case the disease may be primary, or occur in the secondary form. The treatment is to consist in repeated local bleeding with the cupping-glass, continued counter-irritation, the use of the seton, and the employment of mercury and sarsaparilla, as in the case of chronic pneumonia.

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* A letter on Hæmoptysis, &c., Dublin Hospital Reports, vol. v.

† "The treatment," says Dr. Cheyne, "which I would recommend in incipient phthisis may be stated in a few lines. Journeying, if practicable, or what is better still, in fine weather going from shore to shore in the steamers; short residences at Mallow, or the Cove of Cork, or some favourite spot in England, or, during the summer, in Scotland. Diet as generous as the state of the lungs will permit; in some cases a glass or two of claret, and small bleedings. Sponging the chest and arms with very dilute nitro-muriatic acid, or with five parts of Mindererus's spirit, and one of spirit of rosemary; an issue over the most suspected portion of the lungs, or a succession of blisters, after each bleeding, each not much larger than a dollar; a light bitter two or three times a day, with twenty or thirty drops of laurel water, or the nitro-muriatic acid internally, or perhaps some preparation of iron. If I had time I would explain my reasons for rarely sending patients in any stage of consumption to the continent of Europe."—*Op. cit.* p. 364.

MERCURIAL TREATMENT OF INCIPIENT PHTHISIS.—The idea of arresting the progress of scrofulous inflammation of the lung by mercury occurred about the same time, and without any mutual communication, to my friends Drs. Graves and Marsh, and to myself, and for the last few years these gentlemen and I have treated with mercury several cases of incipient pulmonary disease, which would in all probability have ended in phthisis.* But a great number of observations must still be made in order to establish the actual value of this practice, and it must be recollected, that in the cases thus treated, other and active means were employed to remove the local disease.

Independent of the case of tracheal irritation, I have observed the action of mercury in some instances where the lung was decidedly engaged; in two, permanent recovery followed; in one the disease was arrested for some months, after which it returned with its former symptoms, and the patient died tuberculous; and in one, although mercury was thrice employed, no good effect whatever followed; and on its last exhibition the remedy manifestly disagreed. I shall briefly notice these cases.

A gentleman, aged twenty-four, was attacked with violent hæmoptysis; in a week afterwards he presented the following symptoms: the respiration was hurried, the cough troublesome, with a scanty, mucous, and bloody expectoration; the pulse quick, and the action of the heart strong; fever of a remittent character with a tendency to perspiration existed; the patient lost flesh, looked pale and haggard, and complained of pain in the upper portion of the left side.

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* This subject is alluded to in Dr. Graves's Clinical Lectures, published in the Medical Gazette of this year. The facts stated in Dr. O'Beirne's valuable paper on the use of mercury in diseases of the cartilages, (Dublin Medical Journal, vol. v.) first led to the hope, that by similar treatment a strumous inflammation of the lung might be arrested.

The antero-superior portion of the left side sounded comparatively dull; the respiration was here very feeble, with an obscure rale evident on deep inspiration; clearness of sound and puerile respiration existed over the remaining portion of the chest.

No doubt could be entertained that if the symptoms and signs were not removed, a rapid consumption would ensue. The patient was confined to bed; bleeding, both general and local, was repeatedly performed, and mild mercurials exhibited at short intervals of time. The constitutional symptoms were much relieved, but the local signs continued unchanged, and the system resisted the mercurial action; calomel was now exhibited, and ptyalism at last produced, when a marked amendment took place, the sound became much less dull, and the respiration louder. The remedy was now omitted, and a large open blister established, and the patient was removed to the country. His convalescence was slow, but satisfactory; the pulse was kept in check by prussic acid; and in the course of a year his health was restored. During this time several slight relapses took place, but they yielded to local depletion and counter-irritation over the affected part. A slight degree of atrophy of the subclavicular region occurred.

A gentleman, aged 30, was affected for several months with severe dry cough, which was frequently aggravated by exposure to cold and fatigue; he became pale, his pulse was quickened, and he presented all the appearances of approaching consumption. The right clavicle and scapular ridge sounded slightly but decidedly dull; the respiration in the upper portion of this lung was feeble, and mixed with an obscure mucous rale; no signs of bronchitis existed in any other portion of the lung. These circumstances, and the fact of the patient having lost two brothers in consumption, excited the greatest alarm.

The trachea was repeatedly leeched, and mercury, first in the form of blue pill, and afterwards in that of calomel, exhibited: after a considerable time, full ptyalism was produced, when all the symptoms subsided, the chest regained its sonoriety, and the rales altogether disappeared; the patient regained his flesh and strength: several months are now elapsed and he remains in the enjoyment of perfect health.

A middle aged female was admitted into the Meath Hospital with acute phthisis, under which she speedily sank; the lungs were found tuberculated. It appeared that about three months before her final attack, she had been seized with symptoms precisely similar to those which ushered in her last illness; these were subdued by mercury, and during the interval of the two attacks, she had remained free from all pectoral symptoms.

A woman was admitted into the Meath Hospital, labouring under violent symptoms of pneumonia, principally affecting the upper portion of the left lung, which resisted repeated bleedings, both general and local, and the use of tartar emetic; the disease extended to the left lung, without, however, passing into hepatization in the right; mercury was now exhibited, and the mouth made sore, but without any alleviation of symptoms, copious expectoration came on, and the patient died in about three weeks in great agony. Both lungs contained numerous small transparent tubercles, the intervening tissue was of a greyish white colour, and the lung infiltrated with an enormous quantity of a white serous fluid.

A gentleman was attacked with hæmoptysis, followed by violent and distressing cough; under the supposition that the liver was diseased, mercury was exhibited, but without improvement, he then came to town, he had cough, hoarseness, emaciation, and a quickened pulse, and the right clavicle presented a slight degree of dulness. It was determined to again employ mercury, but the medicine distinctly disagreed, no ptyalism was induced, the tubercular symptoms rapidly advanced, and the remedy was of course omitted.

A gentleman residing in France was attacked with severe cough, with a pain in the chest and tendency to hectic. A syphilitic affection had previously existed, but in its primary form, at least, had been removed. The symptoms continuing he came to Dublin. He was emaciated, had incessant tracheal cough, with great irritability of the nervous system. The fits of coughing were most distressing. In addition to these, he had severe pain in the upper sternal and right sub-clavicular regions, which seemed to proceed from periostitis, a diagnosis rendered more probable from the fact of his having distinct periostitis of the scalp, accompanied by maddening headaches. From the violence of the cough, an accurate stethoscopic examination could be scarcely made.

A mild mercurial course completely removed all these symptoms. The patient felt for several weeks restored to a state of health to which he had been long a stranger. He regained his flesh, strength, and appearance, his pulse became perfectly quiet, and he returned to the continent. In little more than two months he died of pulmonary tubercle.

I have now stated my experience of this matter. As to the general employment of mercury in incipient phthisis, I am any thing but sanguine; yet that by its assistance in removing irritation from the mucous membrane, and parenchyma, we may occasionally arrest the development or progress of tubercle, seems more than probable; for there can be little doubt that in the scrofulous habit there is more danger of tubercle from the persistence of irritation of the lung, than from the action of mercury on the system; but the remedy is a two-edged sword, and its exhibition must not be lightly attempted. Extensive numerical investigations must be made before the treatment can be considered as in any way established.*

After the early stages of treatment, if an arrest of symptoms be happily produced, an issue or seton should be established; and the patient should travel, and choose for the next season a temperate winter residence.

Treatment after Excavation has formed.—In a few cases, even after excavation has formed, I have seen a recovery. In these cases there was no evidence of the advance of tubercle, and the larynx and digestive system escaped disease. In other instances treatment has distinctly prolonged life for many years. The principal remedy employed was the seton, with frequent changes of air, or sea voyaging. In some cases the patients confined themselves to a milk and farinaceous diet, while in others they lived freely, indulged in wine, and entered into all the enjoyments of society. In one case where a large cavity existed, the symptoms subsided on the occurrence of fistula in ano. The individual is now in robust health. Two of his brothers died of phthisis.

In a case with cavity, yet in which the symptoms and signs are not progressive, the patient's best chance I believe to be the use of the seton, and travelling. If he does not recover, his life will be probably prolonged. He should take as little medicine as possible; he should adopt all strengthening means, and use such a regimen as experience points out as the best. Heated rooms, cough mixtures, acid draughts, inhalations, narcotics, "repeated counter-irritation," and all the varied and harassing treatment which ignorance supposes to be curative, these are not the means of recovery. So long as a drain from the chest does not weaken, it is clearly useful, and all the other means should be calculated to give enjoyment to the mind and to strengthen the body.[*] The patient's winter residence should be, if possible, in a temperate climate; but his occupation in summer and autumn months should be travelling. The temperate and even colder countries may be visited with advantage.[†]

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* The subject is one of the greatest importance. In all cases it must be remembered, that under treatment physical signs will disappear, or become less evident; and that this proceeds from the removal, not of tubercle, but of intercurrent irritation of the lung. We must, therefore, use the greatest caution in prognosis; and in all investigations bearing on the point, the subsequent history of the patient for months or years, must be if possible ascertained.

In the essential point of equability of temperature the Cove of Cork is surpassed by few places. Recent observations have shewn that the mean difference of temperature of the days and nights rarely exceeds four or five degrees, and often in the winter months does not exceed one degree. The town is completely sheltered from the north wind, and from its southern exposure, receives the full influence of the sun and the southern breeze.

It is only within the last few years that Cove has attained its celebrity. It is now the resort of many invalids. Of course, as in all places of the kind, the good effects of the climate are seen more in the temporary improvement in the health of patients than in their final or permanent cure. Such, however, is the penalty which all places of the sort must pay for their celebrity. Patients in the advanced stages of disease are continually arriving, and the favoured climate is expected to effect impossibilities.

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[*] See Dr. Forbes's notes to the translation of Laennec's work, article Phthisis Pulmonalis. It is no little gratification to me to find my views of treatment of confirmed phthisis coinciding so closely with those of this distinguished physician, to whose exertions British medicine owes so deep and lasting a debt. Our experience of the use of issues is different; but only so far, that in a certain number of cases, very limited indeed, I have known recovery, or great prolongation of life, to occur after their employment. In the vast majority of cases, however, they seem worse than useless.

[†] For winter residences in this country, the patient may choose, in Ireland, the Cove of Cork, and also Mallow; and in England, the various coast towns of Devonshire and Cornwall. Of the latter I have the most favourable experience of Torquay. Dr. Forbes speaks favourably of Penzance. See his Observations on the Climate of Penzance.

I shall not enter further into the subject of climate, but refer with pleasure to the works of Dr. Clark; works which must ever be the guides of the consumptive, and the text books of the student of consumption.*

Palliative Treatment.—I shall here shortly allude to some of the more distressing symptoms, such as hectic, pain, cough, expectoration, hæmoptysis, and diarrhœa.

The hectic is more a measure of the irritation than the suppuration of the lung. It will be often relieved or suspended by local depletion, by an hæmoptysis, or by the adoption of a less stimulating regimen. When the hectic is severe in the early and middle stages, the patient should stay as little as possible in bed. He should not sit during the day in his sleeping-room, which should be a large airy apartment. The chest should be sponged with tepid vinegar and water; frequent changes of linen are to be provided, a fresh garment being put on when the sweating commences; his diet must be of the least stimulating kind, and the digestive system carefully regulated. In a few cases some of the preparations of bark answer well, particularly where the fever assumes an intermittent character; but we cannot persist long in their use. We cannot too strongly denounce the attempt to moderate the hectic sweating by medicines merely, without attention to other circumstances. If the season be mild, the patient should go out every day.

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* I have not in the text alluded to iodine, because I believe that as yet no case has been made out in favour of its exhibition. That its employment is generally adopted on the grounds of false analogy, and in ignorance of the pathology and pathological anatomy of tubercle, cannot be denied, and the consequence is what we might expect, that it is the favourite remedy of the harpies of medicine. Many cases may we see in which precious time is lost in the administration of the supposed specific; many cases of injury of the digestive system, and of acute irritation of the lung occur from its use, whether it be exhibited by the stomach or brought to the lung by direct inhalation. The sufferings of a phthisical patient are sufficiently severe, without being aggravated by the interference of the empiric, who, ignorant of disease, as well as of the better feelings of our nature, prescribes for his own profit; supports his trade by mendacity, and increases his torturing exertions in proportion as his miserable patient approaches the couch of everlasting rest.

The pains are best relieved by a few leeches, or what is as good, a small blister over the affected part, which may afterwards be dressed with the ointment of morphia. The application of turpentine sprinkled on a hot cloth will often succeed; and in many cases, the belladonna or other anodyne liniments will remove the pain. When, however, the pain is accompanied with the friction signs, the best treatment will be a few leeches or a blister.*

In the course of a single case we must have recourse to various remedies to allay the cough. All the different forms of demulcents and opiates may be employed; of the latter, the most preferable are the different preparations of opium, hyosciamus, cicuta, and belladonna. Inhalations of the vapour of water, containing a narcotic extract, are often useful.

Where the cough resists these means, a few leeches applied to the trachea on the principle advocated by Broussais, and more lately adopted by Dr. Osborne, will often give relief; and in some chronic cases, where even all these means fail, I have often found that the common anti-spasmodic mixture of camphor, valerian, opium, ammonia, and æther, gave the greatest relief.

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* There is a curious neuralgic affection of young females which simulates the pain of phthisis. The patient complains of severe pain of one clavicle, generally the right; the pain is remittent or intermittent, and accompanied with exquisite tenderness; the diagnosis is drawn from the absence of the stethoscopic signs of pulmonary or pleural irritation, the clearness on percussion, and the absence of constitutional symptoms. The value of these diagnostics is of course directly as the chronicity of the case.

But the greatest caution must be used in adopting measures to check expectoration, for it is the natural relief of the lung, and unless its quantity is so great as to run down the patient's strength it should not be interfered with. Its arrest too often lights up new irritation in the lung, or produces the enteric complication. I have seen the most dreadful consequences from the use of stimulating inhalations, carelessly or too long employed. Those of which I have had much personal experience, are the inhalations of iodine, chlorine, and tar. They all act in arresting the secretion of the lung, and are consequently hazardous. They have no specific action on tubercle, but by arresting purulent secretion they cause a more rapid development of the disease. I have seen the chlorine inhalations used in a number of cases, and always with bad effects; fresh irritations of the lung, pains of the side, tightness of the chest, sudden anorexia, diarrhœa, and sopor, have followed its use.

If there be any means likely to diminish the chance of injury from inhalation, it is the combining it with decided and extensive counter-irritation.*

When hæmoptysis occurs, its treatment must vary according to the accompanying circumstances. In the active variety, or that accompanied with much fever or excitement of the heart, our best treatment will be small general, and local bleedings, the application of leeches to the feet, the internal use of ice, and the different astringents, particularly sulphuric acid, alum, and the acetate of lead in free doses.

The diarrhœa, proceeding as it almost always does from an enteritis, is best treated by attending carefully to regimen; in

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The experience of Meriadec Laennec, and of Dr. Forbes, is opposed to the use of chlorine. Why is it that medicine is still to be disgraced by publications similar to those in which we find this treatment recommended? publications, to use the words of Dr. Forbes, "alike unworthy of the notice of the honest pathologist and the philosophical physician."

the early stages it can be generally commanded by the ordinary cretaceous and opiate medicines, but these soon lose their effect. We must then use the metallic astringents combined with opium, and have recourse to small anodyne enemata: when even these fail, I have often seen the most marked advantage from the application of a blister to the abdomen. In many cases the diarrhœa was permanently arrested, and the comfort of the patient materially improved.

APPENDIX TO THE PRECEDING SECTION.

In the preceding pages I have not dwelt on the characters of expectoration in phthisis, for two reasons, first, that these have been so fully described by Andral, Laennec, Forbes, and others, and next, that I have not made any original observation upon them. The student of consumption must, however, recollect, that there is no constant relation between the appearances of the expectorated matter and the state of the lung; that in many cases the expectoration is not characteristic; that it may be mucous, while great cavities exist in the lung, or purulent from bronchial irritation merely. It may be scanty, or copious, or even absent, although the lung be full of excavations. If we inquire whether there be any kind of expectoration more peculiarly allied to phthisis, I would say, it is that described by Dr. Forbes, in which globular ragged masses are expelled.* I do not recollect a single case in which I observed this character, that did not turn out to be phthisis.

I have observed several cases of calculous expectoration, in which a great quantity of tubercle seemed to have undergone the cretaceous transformation. The patients after having undergone an attack of severe bronchitis affecting the small tubes, became hectic, and expectorated purulent matter in quantity. No signs of excavation existed, but one side presented a certain degree of dulness, with a muco-crepitating rale. These symptoms continuing for several weeks, small calculi began to appear in the expectoration. These gradually increased in number until a vast quantity were expelled. Their size was generally about that of a large pin's head, and often two were connected by a stalk so as to have an hour glass form. The discharge of these calculi continuing for a month or six weeks, the patients began to recover, and ultimately regained their flesh and strength, until a new attack. The attack may recur several times, between which a chronic bronchitis continues. The disease is more likely to affect middle aged than old persons.

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* Translation of Laennec, p. 322. The entire note is of great importance.

The plan and limits of this work do not permit me to enter into many important subjects connected with tubercle, such as the influence of age, and the history of predisposing and exciting causes. But this gives me little regret, when I can refer to the works of M. Louis and Dr. Clark, and to the excellent digest of the state of our knowledge as to treatment, appended by Dr. Cowan to his translation of M. Louis' work.

With respect to the question of the nature of tubercle, I may state, that I am altogether opposed to the doctrines of Barron, on the one hand, and Broussais on the other. It seems a lesion of secretion, connected closely with the albuminous condition, generally deposited under the influence of irritation, but occasionally appearing without evidences of any local excitation. There is no proof of tubercles being hydatids, or any thing analogous to them. Miliary tubercle is not a cyst; it does not contain other cysts; and the proposition that tubercle and hydatid frequently coexist, may be true with respect to graminiverous animals, but is altogether unfounded in the case of man. On this point Laennec and Louis, no mean authorities, agree. Laennec states that cysts, which he distinguished from hydatids, are among the rarest appearances of the lung. He gives but two cases in which hydatids were found; the symptoms were not those of phthisis. Louis out of a vast number of cases, only found hydatids in three; in two of these cases the acephalo-cyst occurred in the brain; in the third, in the liver; and out of six thousand cases admitted into La Charité, only one occurred that presented the complication of tubercle and hydatid; a complication which, I may add, I have never witnessed after many hundred dissections of pulmonary phthisis.*

But, further, the symptoms of pulmonary hydatid and tubercle are not the same. In some cases there have been symptoms of chronic pneumonia. In a case by Andral, signs of morbus cordis existed; while in other instances, there were no evidences that the lungs were at all engaged. Nor is the proposition that hydatids is transformed into tubercle of any value, it is an admission of the difference of these bodies, and only refers to the common development of tubercle in a serous sac. But there are many other points totally irreconcileable with this theory. The case of tubercular infiltration is sufficient to overturn it;† the occurrence of tubercular matter in the blood; the supervention of internal tubercle, after the removal of external scrofula; the development of tubercle from acute and chronic inflammation of the lung, whether traumatic or idiopathic, are all facts difficult, if not impossible, to be reconciled with the theory of Dr. Barron.

This question, however, is a different one from that of the separate or independent vitality of tubercle. But although our inability to inject tubercle is no proof whatever of its separate vitality, it must be admitted the question is a difficult and interesting one, more so indeed than is supposed; and until the line of distinction is drawn between a secretion and an organization, the point must remain unsettled.‡

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* Andral. Clinique Medicale. Maladies de Poitrine.

† Dr. Barron particularly objects to the term tubercular infiltration, expressing his regret that it should ever be used in medicine. He ought rather to regret the occurrence of the disease, for it is fatal to his theory.

‡ See an essay on the Origin and Nature of Tuberculous Diseases, by R. Carmichael, M.R.I.A., Dublin, 1836.

SECTION IX.

DISEASES OF THE PLEURA.

We shall arrange this subject as follows:

1st. Simple adhesions by inflammation.

2nd. Pleuritis with effusion.

3rd. Ulcerations of the pleura.

4th. Passive or mechanical effusions.

Before, however, we enter on these subjects it will be nessary to premise some observations on the structure of the pleura, and to develope my views as to the influence of disease on the muscular expansions of the chest.

It has been long taught, that while the pericardium could be demonstrated to be a fibro-serous membrane, at least in that portion not reflected over the heart, the pleura was a serous membrane, between which and the pulmonary tissue nothing intervened, except the sub-serous cellular tissue.

That this opinion is grounded on an imperfect examination of the parts, I have for several years satisfied myself; and I have repeatedly demonstrated the existence of a strong capsule between the serous membrane and the lung, and which completely envelopes this latter organ. In the healthy state, this capsule, though possessing great strength, *is transparent*, a circumstance in which it differs from the fibrous capsule of the pericardium, and which has probably led to the fact of its being heretofore overlooked.

The first instance in which I discovered this membrane, was in dissecting the lung of a patient who had died of chronic pneumonia. On dividing the organ with a sharp knife, through the pleura, I observed three distinct layers. One the pleura; another apparently the sub-serous cellular tissue, much thickened and hardened; and a third of great density, and nearly opaque.

This was the tunic in question. Since then I have several times observed it in the diseased, and also have succeeded in demonstrating it in the healthy lung. But it is always more perceptible in the case of disease, when the tissues are more or less hypertrophied and rendered opaque.

In the healthy lung, however, it is not difficult to exhibit it. The mode which I adopt is the following. A portion of the lung being made to a certain degree tense, by grasping the subjacent parts, so as to inflate the more superficial layer of cells, I make with a sharp scalpel the lightest possible scarification of the figure of an U. This divides the serous membrane, but leaves the fibrous untouched. The lower edge of the serous membrane is then to be seized with a delicate forceps, and by gentle traction, and an occasional division of the true sub-serous cellular tissue, a flap of the pleura can be turned up, leaving the air cells still protected by the strong though transparent fibrous coat. The surface of this latter investment, even after the removal of the serous membrane, is still smooth and shining. The knife is now to be carried through the fibrous coat, and it is to be turned back in the same mode. Its great strength is at once apparent, on its being grasped with the forceps, or raised upon the point of the knife, and the surface of the lung then displayed is irregular and fleshy.

This tunic invests the whole of both lungs, covers a portion of the great vessels, and the pericardium seems to be but its continuation, endowed in that particular situation with a still greater degree of strength, for purposes sufficiently obvious. It covers the diaphragm, where it is more opaque, and in connexion with the pleura lines the ribs, and turning, forms the mediastina, which thus are shown to consist of four layers, two serous, and two fibrous.

This description of the investments of the lung is interesting in a physiological and pathological, as well as an anatomical point of view. It establishes an additional analogy between the lung and the parenchymatous and glandular organs of the abdomen, which have their fibrous capsules, and illustrates the general law, of the constant association of serous and fibrous membrane, as we see to occur with respect to the arachnoid, pericardium, peritoneum, tunica vaginalis testis, and the synovial capsules. Considered pathologically, it may explain the pain of pleurodyne and pleuritis, and the rarity of perforations of the pleura, so remarkable when considered in connexion with the frequency of ulcerations of the lung, which constantly approach so close to the surface as to be bounded by the fibro-serous membrane alone. In pleuritis with effusion, its existence may assist in explaining the binding down of the lung and its corrugated appearance after the removal of the effusion; and as has been suggested to me, it may be the seat of ossifications of the pleura.

But notwithstanding this structure of the pulmonary tunics, we find that the pleural cavities are capable of great dilatation, and that the mediastinum is not that resisting septum which it has been supposed. On the contrary, we find it to yield rapidly to the pressure of intra-thoracic accumulations, and I have repeatedly observed this to occur long before any yielding of the muscular parietes. Hence it is that in empyema of the left side, displacement of the heart occurs long before the intercostal spaces are obliterated, or the diaphragm depressed; and that in a case of dilatation of the cells, as I have already shown, an attack of bronchitis causes the morbid clearness to extend beyond the mesian line. It is not improbable, however, that the strength of the fibrous tissues varies in different individuals; indeed, with respect to the pericardium, the greatest difference of strength exists, for in some subjects we find it dense and opaque, while in others, it is nearly transparent.*

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* The greater or less extensibility of the pericardium may influence the phenomena which result from sudden effusions into the sac, as in cases of rupture of the heart or aorta. In a case of the latter description, with sudden death, I found the pericardium, which had not been previously distended, containing upwards of a pound of blood.

We may now proceed to consider the effects of internal accumulation on the muscular parietes of the chest.

The diseases of accumulation may be divided into two classes. In the first the quantity of air within the thorax is increased; in the second, it is diminished. Of the first, we have examples in Laennec's emphysema, and in pneumo-thorax, and of the next in empyema, hydro-thorax, effusions into the pericardium, and occasionally intra-thoracic tumours; hence the diagnosis of these affections depends, on the one hand, on the evidences of accumulation, and, on the other, on the physical properties of the accumulated matter. In empyema, there is accumulation, and pressure from a non-elastic fluid; while in Laennec's emphysema, and in pneumo-thorax there is also accumulation, but from an elastic medium; hence we arrive at the first step in the diagnosis of these lesions. In empyema we have, in addition to all the evidences of displacement of the lung, the side, the mediastinum, and diaphragm, proofs of *a diminution of the quantity of air*, which may amount almost to its total absence from the affected side, *the sound on percussion being dull.* In the other affections we have also displacement which, as far as the non-muscular portions of the chest are concerned, is similar to that in empyema, but there is evidence that the air has not only not been diminished, but that it is increased, the sound on percussion being clear, or morbidly clear.

When we compare the chests of two individuals, the one affected with empyema, and the other with this dilatation of the cells, we observe that in both there is evidence of accumulation, the side being distended, and the mediastinum displaced. But when we investigate this point more closely, we find some interesting points of difference between the results of these diseases on the thoracic parietes, *particularly with reference to their muscular portions.*

I have already published my views as to the mechanism of the muscular displacement in empyema, and endeavoured to show that the phenomena are inexplicable by the formerly received doctrine of simple pressure from within; but that a loss of tone, a paralysis of the fibres, was necessary before they yielded to pressure.* Subsequent observations have only confirmed me in these opinions.

The peculiar smoothness of the side in empyema has been long described as a pathognomonic sign of the disease. It proceeds, as every one knows, from a yielding of the intercostal muscles, so that the spaces become obliterated, and thus the smoothness is produced. Further we find, as I have shewn in a former paper, that in like manner the diaphragm yields until it may even become concave towards the chest, and convex towards the abdomen; pushing before it the viscera which lie in the upper portion of that cavity.

But these phenomena are by no means so marked in the dilatation of the air cells, in which, as I have already shewn, the disease may exist to a great amount, and the chest be extremely dilated, without any one of the appearances above mentioned. The intercostal spaces continue, in all cases, well and deeply marked; and in one class of cases the diaphragm remains unaffected, even though the pressure be so great as to change the form of the chest.

Let us now inquire why it is that this remarkable difference exists. By examining the circumstances of either case we may arrive at the explanation.

In empyema, there is a combination of vital and mechanical causes. We have *inflammation followed by pressure*, and pressure from a liquid.

In the dilatation of the cells we have only pressure, and this from an elastic fluid.

Now in this circumstance of inflammation of the pleura, which causes the effusion in empyema, and *which continues to*

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* See Transactions of the British Association, vol. v., also my Observations on Paralysis of the Intercostal Muscles and Diaphragm considered as a new source of Diagnosis, Dublin Journal of Medical Science, vol. ix.

act long after the effusion has set in, it appears to me that we have the explanation of the dilated state of the intercostals, and the yielding of the diaphragm.

When a tissue such as a mucous or serous membrane is inflamed, we find that certain effects are produced on the muscular expansions or masses with which it is closely connected; their functions suffer, and we observe, first, an increase of innervation, as shewn by pain and spasms; and next, a paralysis more or less complete. The same circumstances occur when the inflammation is seated in the muscular structure themselves, or in the cerebro-spinal centre from which they derive their innervation. In all these cases, whether of contiguous inflammation, of actual disease of the muscular fibre itself, or of inflammation of the brain or spinal marrow, we have produced, first, a *plus,* and afterwards a *minus* state of innervation. When the latter condition supervenes, the muscular fibres lose their contractility; and if the organ be a tube surrounded by fibres, it dilates; or if an expansion similar to the intercostals or diaphragm, it yields easily to pressure.*

Now the true explanation of the protrusion of the intercostals and diaphragm will be found to be, that they are affected with this paralysis following inflammation of a contiguous structure, that their contractile powers are lost, and that hence they yield easily to a pressure, which, in their healthy state, (as we see in the vesicular emphysema, in hydro-thorax, and the first stage of pleurisy,) they effectually resist.

But we must examine into the evidence of this theory of displacement of the thoracic muscles in empyema.

The first point of evidence is obvious when we reflect on the general effect of irritation on muscular fibre. Now in the case before us we may observe, that the phenomena are in accordance with this admitted effect. In the first stage of pleuritis we have great pain; difficulty of respiration; hurried breathing; pain increased on a deep inspiration; and all this *without protrusion of the intercostal spaces or diaphragm,* but rather with a spasmodic state of these expansions, conditions which accurately correspond to the plus state of innervation observable in the first stage of muscular irritation.

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* Abercrombie has shewn that in Ileus, the contracted portions of the tube are healthy, and that the morbid appearances are confined to the dilated parts; the loss of power being the true cause of the constipation.

But in the more advanced periods, the reverse of all this occurs. The pain ceases, the dyspnœa greatly diminishes, the breathing becomes slower, *the diseased side is comparatively motionless, while the healthy one is acting with great power, and the intercostal spaces and diaphragm yield;* the first causing the characteristic smoothness of the side, and the next, the depression of the abdominal viscera. I need hardly remark, that these circumstances correspond with the minus condition of innervation, or paralysis of the muscular fibres.

The next and most important evidence is the fact, that mere pressure seems insufficient for the phenomenon in question. If the theory which I have given be true, it should follow, that in other diseases of accumulation, where inflammation of the pleura was not present, but where there was merely pressure, this muscular protrusion should either not occur, or be much less marked. Now such may be observed to be the fact. Let us take Laennec's emphysema, hydrothorax, and enlargement of the liver as examples; in all of which there is pressure from within. Thus, in Laennec's emphysema, we have already studied the great enlargement of the chest, and the displacement of the mediastinum and heart, and have seen *that even when the diaphragm is flattened,* (*as occurs in a certain class of cases,*) *its innervation is not destroyed.* In hepatic enlargement we may see, also, evidences of pressure from the great tilting out of the side, and the state of the lung; while in hydrothorax, the pressure is demonstrated by the diminished volume of the lung, which, though a muscular organ, cannot avail itself of its powers in resisting pressure from without.

But notwithstanding this pressure, it will be found that in all cases of emphysema and enlargement of the liver, and in many, at least, of hydrothorax, the intercostal spaces do not yield; a fact which may be constantly verified. I have lately observed three cases of symptomatic hydrothorax, in which, although the effusion amounted to several pints, and the corresponding lung was reduced in volume, neither the intercostals nor diaphragm were affected. The same occurs in the earlier stages of pleuritis, and the sub-acute effusions. In all these cases we may have great displacement of the side or thoracic viscera; yet there is merely pressure, and though the ribs are dilated, the intercostal spaces preserve their relative positions.

The last point of evidence is the fact, that in some cases of empyema there occurs a *sudden* yielding of the diaphragm, which, up to a certain period, had preserved its natural position. This yielding may be as extensive as sudden, and is not necessarily accompanied by increase of effusion. How much more easily can we explain this interesting fact, on the supposition adopted, than on that of gradual pressure on a vitally resisting medium.

From these observations we may safely conclude, that in empyema the protrusion of the intercostal spaces and diaphragm results from a paralysed state of these expansions, and that pressure is secondary to inflammatory action causing paralysis, in inducing the yielding of the muscles.

In my original paper on this subject, I suggested that the amount of intercostal paralysis might furnish a measure of the intensity of the disease, and be thus made available in prognosis; since then two instances have occurred, in which, from the absence of intercostal paralysis, I prognosticated the rapid recovery of the patients. In both, acute pleuritis had been followed by an effusion sufficiently great to cause extensive dulness of the left side, and to push the heart to the right of the mesian line; in one the disease was of ten days, in the other of nearly three weeks' standing; in neither were the intercostal spaces or diaphragm protruded, but, on the contrary, these muscles were acting with vigour. In the first case, little was done, except confining the patient to bed, the heart returned to its position on the third day, and in a week all effusion was removed; in the second, on the seventh day of treatment, the posterior portion of the chest was clear, and presenting the friction sound. The recovery in both instances was rapid and permanent.

In the diagnosis of pleural disease, we may divide the cases into those without effusion sufficient to cause displacement of surrounding parts, and those with signs of accumulation.

DRY PLEURITIS.—This term has been given to that form in which nothing is effused but lymph. The characters of the case may in general be stated to be, that the constitutional and local distress is comparatively slight, that organization rapidly advances, that the sound is clear on percussion,—the phenomena of accumulation or displacement wanting, and the friction signs evident.

We meet with dry pleurisy under various circumstances. It may occur as an uncomplicated and original disease, or as secondary to a general morbid state, such as fever, erysipelas, or the diffuse inflammation; it may be combined with or succeed to any of the affections of the lung, or occur as a complication of cardiac or hepatic disease.

The *physical conditions* of dry pleurisy, however, may be met with in two stages of the ordinary disease; namely, in the earliest periods before effusion takes place, and in the latter stages, when the liquid effusion is absorbed. In the first case the duration of the friction phenomena depends on the rapidity of effusion; in the second, on the vigour of the constitution* which influences the process of organization.

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The characters of this friction sound are various, but in all instances it conveys the idea of two rough and dry surfaces, moving with an interrupted motion upon another. It accompanies the inspiration and expiration, and may be absent during ordinary breathing, but become manifest on a forced expansion of the lung. In the early periods of the disease, pain is often felt in the situation corresponding to the phenomenon; but this soon disappears. In many instances the rubbing sensation is perceptible to the patient for a length of time, but we may repeatedly observe the sound to continue long after the patient ceases to perceive the obstruction.

The sound in the early stages of the simple disease, or immediately after the absorption of an empyema, is frequently accompanied by the rubbing sensation, perceptible to the hand. Like the former sign, this may be absent during ordinary breathing, but become manifest when the patient inspires deeply. In the progress towards cure, this is the first of the physical signs to subside; it is obviously connected with the most unorganized condition of the effused lymph.

Although these phenomena are precisely analogous with those of the dry pericarditis, their characters are not so variable as in that affection, nor are they so speedily and curiously modified by treatment. The organization of lymph seems to advance much more rapidly in the pericardium than the pleura. The sound, however, is susceptible of certain modifications:

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of dry pleurisy, and the influence of mechanical pressure in preventing it, were erroneous; for the friction phenomena occur repeatedly in cases where no solidification exists. In the case of tubercle of the upper lobe, the friction signs are found much more often over the clear than the dull portion of the lung. The following are Laennec's observations on this point: "I am even doubtful whether dry pleurisies exist in which there is simple secretion of a false membrane, without any tendency to serous exhalation at the same time. All the cases mentioned may be reduced to two kinds,—that in which the effused serum has been absorbed before death, and that in which its exhalation has been mechanically prevented by an indurated lung."—FORBES's *Translation*, 1834, p. 397.

thus, in a case of absorbed empyema in a very emaciated subject, the friction sound, which existed extensively over the side, was similar to that produced by the rubbing of a wet finger on a tambourine; it was so loud as to be audible for more than a foot from the patient's chest, particularly when he sneezed, coughed, or laughed. A case has been already mentioned in which the friction phenomena existed both in the pleura and pericardium with a distinctly metallic character, in consequence of the distention of the stomach and colon with air.* The creaking sound, *bruit de cuir neuf*, is rare in pleurisy: I have only observed it in two instances; in both an effusion had been obsorbed, but the phenomenon was by no means so characteristic as that in inflammation of the heart or peritoneum.

Until very lately, I had believed and taught that the friction sounds were always accompanied by clearness on percussion, or with a slightly diminished resonance,—pulmonary expansion, pure, or mixed with rales, being always audible. But I have lately witnessed a case of empyema, in which, although great and universal dulness of the side existed, the phenomena were audible, and even perceptible to the patient in the postero-inferior and lateral portions of the chest. They may, then, co-exist with extensive liquid effusion. This, however, must be considered as an exception to the general rule, that after the absorption of an empyema, the friction sound coincides with clearness on percussion.

The duration of the friction phenomena, depending on the absorption of the liquid, and the rapidity of organization, varies remarkably in different individuals: it is comparatively short in the young and robust; while in the feeble and cachectic, the phenomena may continue without changing for upwards of a month: thus, in a case of phthisis senilis, the friction sound continued for upwards of five weeks audible from the third to the seventh rib. When, however, it succeeds to the absorption of an effusion, it may continue for a period varying from three days to as many weeks. In one case the phenomenon continued unabated for this space of time, but on the patient being sent to the country, it at once subsided. The organization went on rapidly on the improvement of the vital force.

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* Researches on the Diagnosis of Pericarditis, Dublin Medical Journal, vol. iv.

As might be expected, the friction sound is generally more audible over the central than either the upper or lower portions of the chest. I have never found it in the acromial or supra-spinous regions, but have observed it immediately below the clavicle. The case was one of aneurism of the innominata, with pleuritis of the upper portion: dissection verified the diagnosis. In a case of empyema, in progress of absorption, the friction phenomena existed posteriorly down to the very lowest boundary of the thorax.

The rarity of these signs in the upper portion is explicable by the less degree of motion of the pulmonary on the costal pleura.*

When describing the phenomena of dilatation of the air cells, I alluded to Laennec's opinion, that the murmur of ascent and descent proceeded from the friction of sub-pleural vesicles, and stated my reasons for agreeing with Meriadec Laennec in his dissent from this opinion, and without denying the possibility of its occurrence, I must observe that I never met it in any case of Laennec's emphysema, and that in the instance recorded by Reynaud, in which the friction signs coincided with an emphysematous state of the lower lobe in a phthisical patient, the facts are far from conclusive.*

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* In discussing the subject of organization of the false membranes, Andral observes, that this process may occur with an incredible rapidity in some instances, while in others months may elapse without the change occurring: "*L'organisation des fausses membranes ne dépend donc pas seulement du temps plus on moins long qui s'est écoulé depuis leur formation, et aucune règle générale ne saurait être posée sur le moment où cette organisation commence. Il semble qu'il y a sous ce rapport des dispositions individuelles inexplicables, qui, chez les uns, accélèrent l'époque du travail d'organisation, et qui, chez les autres, le retardent. Remarquerons-nous ici en passant que la plus grande analogie existe entre le mode de développement des vaisseaux dans les fausses membranes, et leur mode de production dans la membrane du jaune chez le poulet. Notons toutefois une remarquable différence, savoir, l'inconstance, l'irrégularité du travail d'organisation dans les pseudo-membranes, et, au contraire, la constance et la régularité de ce travail dans la membrane du jaune.*"—*Clinique Medicale*, vol. ii. *Maladies de Poitrine.*

The rarity of the friction phenomena in pneumonia has been already noticed. In no case have I found them after hepatization had formed; and their co-existence with the crepitating rale in the early stages is extremely rare.

A case of acute hepatitis shall be presently noticed, in which the friction signs existed extensively over the right side and region of the liver: the pleura and peritoneum were both engaged.

But one of the most interesting combinations is that of dry pericarditis and pleuritis of the left lung. On this subject we want some more accurate information. In a case of dry pericarditis, with acute pneumonia of the lower portion of the left lung, a singular phenomenon occurred, which could only be explained by the combination of the cardiac and pulmonary friction sounds. During inspiration, the rubbing sounds over the heart became intense and rasping, while at the end of expiration they approached to the bruit de soufflet; in this way a rythm was produced, and that it was connected with the respiration was evident, as it ceased whenever the latter was suspended. In this instance there was probably a double frottement proceeding from the pericardium and pleura; and when we recollect the relative frequency of the lung and heart, we can understand the production of a rythm in the sounds.

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* We owe the discovery of the friction phenomena of dry pleurisy to M. Reynaud. See his original memoir, Sur l'Auscultation de la Poitrine, *Journal Hebdomadaire de Medicine*, tom. v. 1829. The science of auscultation has been much enriched by the labours of M. Reynaud on this subject.

When the lower portion of the left pleura is inflamed while the pericardium remains healthy, the action of the heart may produce a rubbing sound, the result of its impulses on the mediastinum. This sound is synchronous with the heart, and is not interrupted by the stoppage of respiration; it is heard not over the region of the heart, but a little beyond the situation of the pericardium; and in one case in which it occurred, the lower portion of the pleura was covered with recently effused lymph, and the pericardium perfectly healthy. In another case, however, of double pleuritis and pericarditis, this curious phenomenon did not occur, although the friction signs were evident.

Causes of the Friction Sounds.—On this subject there has been some difference of opinion among pathologists; but when we consider that there is a perfect analogy between the phenomena of inflammation of the pleura, pericardium, and peritoneum, we can have little hesitation in adopting the opinion of Reynaud, that in these diseases the friction signs are caused by the existence of unorganized lymph on the surface of the serous membrane.*

In my memoir on the diagnosis of pericarditis,† I have demonstrated, I trust satisfactorily, the dependence of the friction phenomena on the effusion of lymph, and the state of its organization. In the occurrence of the rubbing sounds, and of vibrations communicable to the hand; in their re-appearance after the absorption of fluid from the pericardium; in the continuance of sounds, after the sensation of rubbing is no longer perceptible to the hand, and in their modification by antiphlogistic treatment, there is the most complete similarity between the signs of the dry form of inflammation of the pericardium and of the pleura.

The circumstances to be now noticed have so important a bearing on the subject of the friction signs of pleurisy, that I shall not apologize for noticing them in this place.

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* Journal Hebdomadaire de Medicine, tome v.

† Dublin Journal of Medical Science, vol. iv.

A great difference of opinion has existed with respect to the causes of the friction signs, when occurring in diseases of the abdomen. We owe to Dr. Beatty, of this city, the first observation illustrative of the use of auscultation in the diagnosis of peritonitis. I shall insert his cases.

"In January, 1832, a woman, aged thirty, was admitted into my ward for the diseases of females in the City of Dublin Hospital, labouring under dropsy of the left ovarium. The tumour filled the abdomen from the pubis to the ensiform cartilage, and was remarkably hard and unyielding. A few days after admission she was attacked with severe pain in the belly, and febrile symptoms, which continued for a week, and required the abstraction of blood, and other antiphlogistic treatment, before she was relieved; during which time a remarkable sensation was communicated to the hand when applied over the umbilicus and its neighbourhood. The sensation was that of a grating or rubbing together of two uneven and rather dry surfaces, and was rendered most evident by ordering the patient to take a full inspiration, thereby causing the abdominal parietes to move more freely over the surface of the tumour. By the application of the stethoscope a loud and distinct '*frottement*' was audible, extending over a space of about five inches in diameter, with the umbilicus for a centre. In a few days the pain and inflammatory symptoms subsided, under the treatment employed, and with them the sensation just described, and the audible phenomena, altogether disappeared.

"In the December following, I had an opportunity of observing similar effects, in the case of a young lady who was under my care for excessive enlargement of the spleen. The tumour occupied the left half of the abdomen, dipping down into the pelvis on that side, and its anterior edge passed the median line of the body, particularly at the lower part, where it extended considerably into the right side. She was seized with inflammation of the tumour, and during its continuance, phenomena precisely similar to those described in the last case were perceived; there was the same creaking sensation when either the hand or the stethoscope was applied to the surface, and this entirely subsided when the inflammation and pain were arrested.

"It would appear that this method of diagnosis of disease of serous membranes is applicable only in those situations, where one, at least, of the opposed surfaces is adherent to a solid resisting body. I am not aware that phenomena such as have been mentioned can be perceived in inflammation of the peritoneum, under ordinary circumstances, where the soft pliable walls of the abdomen are in contact with the mass of intestines, but when a large solid tumour comes to occupy the cavity, as in the instances above mentioned, the case resembles that of the pericardium with the heart within it, and similar physical signs of disease of the serous surfaces become apparent."*

But we owe to Dr. Bright the most extensive and important contribution to our knowledge on this subject. The general result of his observations will be best stated in his own words.

"I have observed, on several occasions, that when the circumstances of the disease had rendered it probable *that adhesions might take place between the viscera and the peritoneum of the abdomen, a very peculiar sensation has been communicated to the touch, varying between the crepitation produced by emphysema and the sensation derived from bending new leather in the hand.* And in each of the cases which I shall now detail, I have had the opportunity of discovering, by examination after death, that such adhesions had existed in the parts where this sensation was discoverable; whereas in no case have I observed the phenomenon, and ascertained that the particular morbid condition did not exist; so that I am led to infer the probability that the same adhesive process had taken place in those cases where no opportunity of post mortem examination was afforded."*

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* Dublin Journal of Medical Science, vol. vi. pp. 145, 146.

Within the last year, Dr. Corrigan has taken up this subject, and has demonstrated satisfactorily that the creaking or rubbing sensations, perceptible in the abdomen, are not diagnostic of hydatids on the one hand, or of organized adhesions on the other; but that they arise from the existence of lymph, in an unorganized state, on the free surface of the peritoneum. He has detailed a case in which the creaking sensations continued with variable intensity up to death, the only case on record which is conclusive on the point. The peritoneum was found covered with a layer of firm, rough, spongy lymph, at least the eighth of an inch thick. An ovarian tumour had existed, the nodules or small spherical cysts of which projecting against the peritoneum, left accurate moulds of their forms. Dr. Corrigan reproduced the leather creak by rubbing two portions of the inflamed peritoneum one upon the other; and his observations, combined with the facts recorded by Dr. Bright, leave no doubt that the friction signs of peritonitis are caused by the existence of unorganized lymph; that they are not diagnostics of adhesion, but rather show, to use the words of Dr. Bright, that adhesions are about to form.†

I cannot help observing, that if a careful comparison had been made between these signs of peritonitis and those of the dry inflammation of the pericardium, which I had already investigated, much unnecessary discussion might have been saved. The single fact of our being able to make the diagnosis of obliteration of the pericardium from the cessation of the friction signs, is sufficient to prove that they are diagnostic of the first stage of adhesion, rather than of the completion of that process.

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* Cases and Observations illustrative of Diagnosis when adhesions have taken place in the Peritoneum, with remarks upon some other morbid changes of that membrane.—By R. Bright, M. D.—Med. Chir. Transactions, vol. xix.

† Observations on Bruit de Cuir Neuf, or leather creak, as a diagnostic sign of abdominal disease.—Dublin Medical Journal, vol. ix.

Some confusion has arisen from the adoption of the term *leather creak*. The sign thus designated is only one of the numerous friction phenomena, and the rarest in the inflammations of the pericardium, pleura, or peritoneum. The term crepitus, employed by Dr. Bright, has been objected to by Dr. Corrigan,* inasmuch as it has been appropriated to some of the pulmonary rattles. We might object to it on another ground, namely, that in cases of emphysema of the abdominal viscera we can feel a true crepitus through the parietes.

In a case of aortic aneurism proving fatal, by rupture into the œsophagus, we found the liver in a condition which would doubtless have caused the sensation of crepitus, had pressure been made on it during life. The whole of its substance was emphysematous, air vesicles existing in vast numbers throughout its structure, and on the surface causing distinct eminences. The lobe of Spigel closely resembled a portion of emphysematous lung, the whole organ floated on water, and crepitated intensely on pressure; no putrefaction had occurred in this case.

It is interesting, as connected with Dr. Beatty's views of the friction sound in peritonitis, that in the majority of cases in which these phenomena occurred, a tumour existed of some kind, to which the serous inflammation was superadded. Thus in his two cases, in that recorded by Dr. Corrigan, and in three of those given by Dr. Bright, abdominal tumours existed, from which we may infer that the pressure of the tumour favours the occurrence of the friction signs.

I have observed peritoneal frottement in two instances. In both a tumour existed in conjunction with the peritonitis.

A boy aged 12, was attacked with pleuritis of the right side, which continued for some days; when he was admitted into hospital he had fever, hurried breathing, cough, pain of the side, and a bilious hue of the skin, the right hypochondrium was full and resisting, and the liver was plainly enlarged, the upper and middle portions of the right side sounded clear on percussion, and respiration, marked by an intense friction sound, could be extensively heard. On placing the stethoscope over the hepatic tumour, when the patient took a deep inspiration, the same phenomenon existed, manifestly proceeding from the roughened state of the peritoneum itself; the symptoms and signs rapidly disappeared under antiphlogistic treatment. This case was obviously the ordinary combination of inflammation of the hepatic peritoneum with pleuritis.

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* Researches on the Diagnosis of Pericarditis, Dublin Journal of Medical Science, vol. v.

A middle aged man was attacked with excruciating pain in the back, accompanied by fever. The symptoms continuing for many days without relief, a tumour appeared in the epigastrium, it rapidly increased, and acquired a strong and visible pulsation. The pain in the back subsided, and the fever declined; the question now arose, as to whether the tumour was aneurismal. The sudden and excruciating pain in the back, the appearance of the tumour followed by the subsidence of the pain, and the strong pulsation in the epigastrium, seemed to favour the opinion, that the disease was aneurismal: on the other hand, the fact that the disease had set in with fever, made strongly against this opinion, and made us lean to the opinion, that the tumour was the left lobe of the liver, in a state of inflammatory turgescence, and receiving pulsations from the excited abdominal aorta. The question was set at rest by the following observation. When the hand was laid on the tumour during ordinary breathing, nothing was perceived but the strong and almost diastolic pulsations, but on the patient's taking a deep breath and depressing the diaphragm, the most intense friction signs of descent and ascent became at once perceptible to the hand and ear. They existed only over the situation of the tumour. This observation, coupled with the history of the case, convinced us that the tumour was inflammatory, and therefore in all probability not aneurismal. The patient rapidly recovered.

I shall now throw into a tabular form the observations which we possess on this subject. It will be seen that out of twelve examples of peritoneal frottement, there was an organic tumour in nine cases; from which we may conclude with Dr. Beatty, that the presence of tumour renders the friction phenomena more distinct,[*] and that this may explain the more marked characters of the signs in pericarditis than in pleurisy.

PERITONEAL FRICTION SIGNS.

1.	Beatty.	An ovarian tumour, peritonitis.	Recovery from the inflammation.
2.	Do.	An enlarged spleen, peritonitis.	Recovery from the inflammation, with cessation of the signs
3.	Bright.	A fungoid tumour.	
4.	Do.	Vast ovarian tumour.	Adhesions of the parietal peritoneum to the tumours.
5.	Do.	Universal peritonitis: sensation of a tumour during the period of crepitus.	Obliteration of the peritoneal cavity by adhesions.
6.	Do.	Absence of tumour; crepitus general over the liver after tapping.	Colon and omentum adhering to the parietal peritoneum.
7.	Do.	Abdominal crepitation.	Peritoneum covered with miliary tubercles; acute peritonitis.
8.	Do.	An abdominal tumour, with chronic peritonitis.	No dissection.
9.	Hutchison. (See Doctor Bright's paper.)	Abdominal tumours; peritonitis.	Enlargement of the spleen, mesenteric glands and pancreas; scirrhous hardness of the omentum.

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[*] It would be highly important to examine cases of peritonitis from perforation of the digestive tube, with the view of detecting the friction signs. I anticipate great advantages in diagnosis and treatment from such an investigation.

10.	CORRIGAN.	Abdominal tumours; creaking sensations after tapping; continuance of the friction signs up to death.	A large ovarian tumour; peritoneum covered with rough spongy lymph.
11.	The AUTHOR.	Inflammatory tumefaction of the liver, with peritonitis and pleuritis. Friction signs both in the chest and abdomen.	Recovery, with cessation of the signs.
12.	Do.	Tumour of the left lobe, with friction phenomena.	Do.

PLEURITIS WITH LIQUID EFFUSION.

This disease may be met with under various circumstances. It may occur primarily, in a healthy constitution, and accompanied by high inflammatory symptoms, which demand, and bear, a vigorous antiphlogistic treatment. It may supervene in the more delicate or lymphatic subject, without great severity of symptoms, and with but little fever. It may complicate acute or chronic diseases of the lung or liver, or succeed to the metastasis of an inflammatory rheumatism.

But there are other forms in which we find it accompanied with much greater danger. In most of these a typhoid state has preceded, and accompanies the disease. The liquid effusion is rapid and copious, and nature makes little if any effort to absorb the fluid, or organize the lymph.

This secondary or typhoid pleuritis, is met with in the following cases.

1st. Typhous or maculated fever.

2nd. Occurring in the course of the exanthemata.

3rd. Complicating the diffuse inflammation.

4th. Occurring in bad erysipelas.

5th. Consequent on phlebitis.

6th. Consequent on purulent absorption.

Lastly, we have a pleuritic inflammation from perforation of the serous membrane, analogous to peritonitis from a similar cause. This we shall examine when describing ulcerations of the pleura.

ACUTE STHENIC INFLAMMATION.—Fever, acute pain of the side, hurried and interrupted breathing, and dry cough, with a hard resisting pulse, are the prominent symptoms of this disease in its early stages. The pain is often intense, all motions of the thorax increase it, and the affected side is fixed and motionless. The patient complains of intense heat within the chest, and there is not unfrequently an extreme tenderness of the integuments. The pain occurs in various situations. The infra-mammary, and inferior lateral regions are the most common, but it may be most severely felt in the shoulder, the axilla, the lumbar region, or lower portion of the right hypochondrium or hypogastrium. In many cases it is accompanied by a puffy tumefaction of the integuments, threatening superficial abscess. In a case of this kind, where the shoulder was the seat of pain, I have seen the sterno-clavicular articulation loosened, and the clavicle extensively dislocated.

The pain, after continuing for forty-eight or sixty hours, in general diminishes or ceases altogether, and this coincides with an effusion. But in some severe cases the pain continues with slight remissions, long after copious effusion has occurred, or even remains unabated up to the period of death.

During this first stage the patient seldom lies on the affected side, in consequence of the position causing increase of pain. The rule generally is, that in the first stage the decubitus is on the healthy, in the second on the diseased side. But to both these observations many exceptions occur. Thus in the second stage, when pain ceases, and copious effusion occurs, we may often see the decubitus on the healthy side.*

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* On this subject Andral remarks, that the decubitus is most commonly on the back, with a slight tendency to one side, (*decubitus diagonal.*) I cannot agree

When the diaphragmatic pleura is engaged, there is generally orthopnœa; as might be expected, the respiration is more hurried and difficult during the persistence of the pain. I have long been satisfied, that in this disease, as well as in pneumonia, the acceleration of breathing was to be explained more by the excitement of the lung attending acute inflammation, than by pain on the one hand, or mechanical obstruction, as from hepatization or effusion, on the other. There are of course cases of sudden extensive solidity, or enormous and rapid effusions, where a mechanical cause must be admitted, but these are not the ordinary cases, in which (with respect to dyspnœa and acceleration of breathing) we see a great similarity between pneumonia and pleurisy. In one an improvement in breathing may coincide with an extensive hepatization, the patient being apyrexial, and in the other, even with a copious effusion, there may be great ease of respiration.

Indeed, nothing can be more singular than the slight degree of suffering, which may coexist with an extensive recent effusion. I have often been consulted by patients, in consequence of their finding the heart pulsating at the right side. They had never been confined to bed, nor supposed themselves unwell, further than that they found a little shortness of breath on exercise. They confessed having had a slight cold some time back, but nothing sufficient to make them change their ordinary habits. I have seen a copious recent effusion, of which no symptom existed but a collapsed countenance; fever, pain, and cough, were absent; yet in a week the heart had been displaced; nay, further, it may coexist with a good appetite, and perfectly healthy appearance.

The disease, when established, runs one of two courses. The

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with him in his statement, that during the existence of fever and dyspnœa, the decubitus on the healthy side is impossible. But every practical man must coincide in his opinion, that the decubitus gives us no sign by which we can recognize the disease.—*Clinique Medicale, Maladies de Poitrine*, tome ii. When speaking of chronic pleurisy, I shall return to this subject.

effusion may increase rapidly; and between the first attack and fatal termination, no interval of ease is afforded to the patient; or, more frequently, as in other visceral irritations, a change of symptoms occurs, characterized by diminished suffering, and a transition from the inflammatory to a hectic, or nearly apyrexial condition. The symptoms vary according as the effusion is on the increase, or stationary. In the first case we observe the cough continuing with increase of dyspnœa on motion; the patient emaciates; the countenance becomes pale, or sallow, and contracted; palpitations are complained of; and the feet or ankles become slightly swollen. In this condition the side will be found extensively dull; the mediastinum displaced; and in all probability, protrusion of the intercostals or diaphragm will be found to exist.

But when the effusion is not very extensive, nor on the increase, it may coincide with a constitutional state, but little removed from health. The patient may gain flesh and strength up to a certain point; his countenance shall not be expressive of visceral disease; he shall have little or no hectic; and be enabled to take exercise. In this way the patient may go on for months. The disease is almost always mistaken, and treated as debility, consumption, remittent fever, liver disease, or morbus cordis; and too often it happens that the neglect and exasperation of the disease produces the affection for which it was first mistaken.

I have known a case to pass through all its stages, from effusion to absorption and cure, where the lesion was never suspected. The real nature of the disease was learned accidentally long after recovery had taken place. While the child was in the act of dressing, its mother, in slipping off the shirt, perceived the deformity of the left side. I saw this case, and never before witnessed such great contraction, otherwise the recovery was perfect. In the young female there is no error more common than treating this disease for phthisis, proceeding from suppressed uterine action. In several instances I have been able to correct this important error in time. In all, the effusion was confined to the lower lobe; and the uterine action returned on the removal of the effusion.

There is nothing characteristic in the expectoration. In the early periods the cough is dry, or there is nothing expelled but a little transparent mucus; in the advanced stages, the discharge is more copious; and under these circumstances, the case is often supposed to be confirmed phthisis.

The disease may terminate by asphyxia, in consequence of an enormous accumulation. The fluid may be evacuated by an ulcerative opening in the thoracic integuments, or into the lung itself, or pass through the diaphragm into the abdomen. The effusion may be absorbed rapidly or with extreme slowness, and the patient be restored at once to health, or pass through the doubtful convalescence of Laennec, under which circumstances, he runs the greatest risk of pulmonary consumption.

Such is the history of the simplest form of this disease; but it presents numerous modifications, according to its violence, situation, and extent, and also the susceptibility of the patient: to one of the most remarkable of these cases the name of diaphragmatic pleurisy has been given.

DIAPHRAGMATIC PLEURISY.—It was taught in the older books that delirium and the risus sardonicus occurred as symptoms of inflammation of the diaphragm. Modern observations have shown that these symptoms are by no means constant, and not more indicative of diaphragmitis than of other diseases. Andral has given the following symptoms, as indicative of this disease. A severe pain, increased by pressure, inspiration, and by every effort, is felt along the edge of the false ribs; it extends into the hypochondria, and is accompanied by complete immobility of the diaphragm. There is extreme anxiety, alteration of the countenance, and the patient sits bent forward: any attempt to change his position producing intolerable pain; in some cases hiccup, nausea, and vomiting, have been observed.

The same author has given four cases of this affection. In the first, inflammation of the right diaphragmatic pleura, in addition to the other symptoms, was accompanied with bilious vomiting and jaundice : the liver was displaced. In the second, a chronic phthisis had existed, on which pleuritis of the left side supervened. *From this time till the period of death, the respiration was purely costal.* A vast collection of pus was found in the left pleura : the diaphragm was perforated, and the purulent matter effused behind the peritoneum. In the last two cases, the symptoms supervened in the progress of disease, in the one instance, of the pleura ; in the other, of the lung itself. In the case of pleuritis, the disease was nearly latent until the diaphragm became engaged.

It is obvious that symptoms such as the above do not necessarily belong to inflammation of the diaphragmatic pleura, as they are seldom or never met with in ordinary empyema, when the whole pleura is equally engaged. On this subject additional facts are required.

Other forms of partial pleurisy have been observed,* viz. :—

Inter-lobular pleuritis, forming a collection of pus, simulating pneumonic abscess.

Circumscribed inflammation of the costo-pulmonary pleura. This affection is much more common than the preceding. It may occur in the upper, lateral, or inferior portions of the chest. I have seen it, when existing in the antero-superior portion, mistaken for pulmonary tubercle.

In such cases, perforation of the pulmonary or costal pleura may occur, and the matter be expectorated, or evacuated through the integuments. I have seen three cases in which a fluctuating tumour existed externally for a great length of time, the tumefaction of which varied with the respiration, being greatest during expiration, while the tumour fell in on inspiration ; and it seems probable that this would occur in all cases where the matter had perforated the thoracic walls, and was confined only by the external muscles and integuments. I have seen a case in which matter in great quantity had already existed in the right pleura, displacing the liver. A fluctuating tumour appeared over the lower sternal region, which was considered to be connected with the internal empyema. On examination, a distinct circular perforation could be felt over the last bone of the sternum. The abscess was opened, a small quantity only of scrofulous matter was evacuated, and the apparent orifice turned to be the raised edges of the base of the abscess, which had resulted from sternal periostitis, and had no connexion whatever with the pleural collection.

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* Clinique Medicale, Maladies de Poitrine. See also J. P. Frank, De Curandis Hominum Morbis, who has accurately described the disease.

Here the tumour, though fluctuating, had nothing of the alternating collapse and puffing out, corresponding to the acts of respiration.

Acute pleuritis may be complicated with pneumonia, bronchitis, inflammation of the pericardium, or peritoneum. M. Tarral has taught that the complication of pneumonia is more frequent than has been supposed ; and that in many cases, by changing the position of the patient, we can discover a crepitating rale, before inaudible. He believes that pleurisy with effusion never exists without pneumonia.* My experience is altogether different : it is true I have seen this complication, but never in the simple original pleuritis. In my cases, a chronic inflammation of the parenchyma preceded the pleurisy, or the disease was of the typhoid or secondary form, which has been already noticed.

Laennec has described three varieties of this complication. The first is the ordinary one of pneumonia, with slight dry pleuritis. In the second, inflammation of the compressed lung may occur, producing that variety of hepatization, which he has denominated carnification ; while in the third, severe inflammatory action affects both the pleura and lung. This is by far the rarest case.*

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* Recherches sur la Diagnostique des Maladies, Journal Hebdomadaire de Medicine, vol. vii. 1830.

My experience of the complication with pericarditis is but limited, but, as far as it goes, is different from that of Broussais. In my cases, however, the pericarditis was of the dry form, in which the symptoms are never so violent as in that with effusion. I have observed this complication in cases of acute pleuritis, and in two instances of very chronic empyema: in the latter cases, the usual symptoms of pericarditis were completely wanting; and no new suffering marked the invasion of the disease, which was only to be discovered by auscultation.†

The observations of Broussais apply rather to cases with copious effusion: he dwells particularly on the precordial pains, the great anxiety, and want of sleep. The patient sits bending forward, with his head resting on his knees; and yet, notwithstanding great concentration of the pulse, there is a tendency to fainting, and almost complete absence of fever.‡ I have no doubt that, under such circumstances, the complication in question might be safely diagnosticated.

CHRONIC UNCIRCUMSCRIBED PLEURISY, WITH EFFUSION.—To this condition, whether supervening on an acute and violent attack, or from the first with sub-acute symptoms, the name of empyema has been long given. And although the composition of the fluid effused is often different from that of pus, it being sometimes bloody or serous, yet the term is applied conventionally to these as well as to the purulent effusions.

Chronic effusion, compressing the lung, and displacing the mediastinum, may exist with or without distressing constitutional symptoms. In the first case, if we separate the physical signs, we find nothing characteristic in the symptoms alone; hectic may or may not be present; and no characters of the cough, expectoration, respiration, decubitus, or, with a single exception, the appearance of the patient, are sufficient to distinguish this from other diseases of the lung. The exception alluded to, is the dilatation of the side and intercostal spaces—a subject which we shall just now handle.

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* Laennec, Forbes's Translation.

† See my Researches on the Diagnosis of Pericarditis, Dublin Medical Journal, vol. vi. Also Dr. Law's Pathological Obervations, *ibid*, vol. vii.

‡ Traité des Phlegmasies Chroniques, tom. i.

But if, in addition to the symptoms of pulmonary irritation and obstruction, as shewn by cough; dyspnœa, increased by exertion, and by lying on the healthy side; and a sense of fulness and oppression referred to one side, which is often œdematous, we find the physical signs of accumulation, compression, displacement, and paralysis of the thoracic muscles, we may safely diagnosticate the disease in question.

In certain instances, however, the symptoms are all but wanting. I have repeatedly known persons with copious effusions, to look well, to be free from fever, pain, or any local distress; to lie equally well on both sides; to have good appetites, which they could indulge without apparent injury; and all this when the heart was pulsating to the right of the sternum.

Thus it appears, that in both classes of cases, the physical signs are of the last importance. Indeed, in pleuritic effusion, physical signs have greater value than in any other thoracic disease. Most cases of bronchitis, of pneumonia, and of phthisis, can be at least recognized without these aids; but such is not the case in pleurisy; and it is fortunate that its physical signs are more simple, numerous, and striking than those of any other of the uncomplicated diseases of the lung.

In the failure of the attempt to found any differential diagnosis on the symptoms of chronic pleurisy, considered apart from physical signs, we must study the latter with care, and the more so as the statements on empyema contained in surgical books, are exceedingly loose and insufficient. Before entering on the signs, however, we shall recur to the subject of decubitus on the affected side.

As a symptom of copious effusion, we meet with it more frequently in the chronic cases: yet even here it is often absent.

As a sign it is anything but pathognomonic: as a constant symptom I have only observed it in extreme cases, and where the mediastinum and diaphragm were extensively displaced. Facts are still wanting to clear up the cause of this symptom. Richerand, believing that the mediastinum was a strongly resisting septum, denied the doctrine of Le Dran, that the difficulty of lying on the healthy side, arose from the pressure of the superincumbent fluid, and attributed it solely to the obstruction to dilatation of the healthy side, in consequence of its being placed undermost.

But the extensibility of the mediastinum cannot be denied. The fact, which I have often observed, of displacement of the heart before that of the intercostals, or diaphragm, is sufficient. On this point Dr. Townsend observes, that in cases of pneumothorax, with empyema, we have direct proof of the influence of the weight of the fluid.

" The patient can generally lie on the sound side so long as the effusion is principally gaseous ; but as the proportion of ponderable fluid increases, decumbiture on the sound side becomes impossible. In like manner in cases of empyema, the dyspnœa is in general greatly aggravated by lying on the sound side; but when the fluid is evacuated, the patient is immediately enabled to turn on the sound side, although the necessity for its free dilatation continues as great as before, the diseased being still in a state of perfect inaction. In the case of pneumothorax with empyema, related in the fifth volume of the Dublin Transactions, in which the operation of paracentasis was performed, the patient was enabled to lie on the sound side the night after the fluid was drawn off, though it was ascertained by auscultation that the side was then filled with air, and the necessity for the free dilatation of the sound side consequently as great as before the operation.

" These observations render it probable that the difficulty of lying on the sound side arises from the load which is thereby thrown on the mediastinum, as well as from the obstruction which the muscles of inspiration experience when the side which they have to dilate is placed under the weight of the body. To avoid this inconvenience, patients labouring under effusion into the chest generally lie on the diseased side, or else on the back, with a slight inclination of the body towards that side. This latter position is the more general of the two, and is so very characteristic, as to lead in some cases to a suspicion of the disease, even before any further examination has been made. This position, however, is not so constantly observed, but that we meet with frequent deviations fròm it. When the fever has completely subsided, and the thoracic viscera have become habituated to the pressure of the effusion, the patient can sometimes lie indifferently on his back, or on either side; and there are even some cases on record, where the patient lay constantly on the sound side. J. F. Isenflamm relates a remarkable case of this kind, in which a patient, presenting all the usual symptoms of empyema, lay generally on the right side, which, for this reason, was supposed to be the seat of the disease: accordingly, the operation was performed, but no pus was found.* The patient died; and on dissection, it was discovered that the left side was the seat of the empyema. Morgagni relates a case of this kind on the authority of Valsalva; and M. Baffos records another instance.† These, however, may be considered as exceptions to a general rule, and probably depend on some adhesions which confine the effusion, and prevent its gravitating to the most dependent part of the chest."‡

There seems reason for admitting both the explanations of Richerand and Le Dran, as adopted by Dr. Townsend; for although the decubitus on one side interferes less with respiration of the corresponding lung than we would *a priori* suppose, yet it has some effect; and, on the other hand, it is easy to conceive a case in which the fluid, by lying on the mediastinum, would, by its weight, oppress the heart and affected lung. In an extreme case, however, where the pleural sac was at its maximum of distention, it seems possible, if the patient had become habituated to the new condition of the mediastinum, that decubitus on the healthy side would not cause so much distress as in cases with less effusion.

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* Versuche einer praktischen Abhandlung ueber die Knochen. Erlangen, 1782.

† Dissertation Inaugurale sur l'Empyeme. Paris, 1814.

‡ See Dr. Townsend's Essay on Empyema, Cyclopædia of Practical Medicine.

But there is another cause as not yet unnoticed, namely, the effect of change of position on the abdominal viscera. In a case with protrusion of either ala of the diaphragm, the turning on the healthy side would, by increasing the pressure on the abdominal viscera, impede the descent of the opposite portion of the muscle, and consequently produce distress of breathing. It would have the same effect as we see from accumulations in the bowels, or from external pressure, as accurately observed by Dr. Townsend, who, in testing the statements of Bichat and Roux, that pressure on the side of the abdomen corresponding to the effusion caused extreme distress, by forcing up the fluid, and increasing its pressure on the lung, found that the very reverse was the fact; for, while no uneasiness was produced by pressing up the diaphragm on the side where the effusion existed, any attempt to stop the motion of the opposite ala of the muscle caused extreme and immediate distress.*

Considering the great weight and mobility of the liver, we should expect that in empyema of the right side, there would be greater distress from the cause now pointed out than in the opposite case.

As the physical signs of the primary sthenic, and secondary or typhoid varieties of pleurisy are the same, it will be right to discuss them before we examine the latter forms of the disease. Indeed so latent, *quoad* symptoms, are many cases of the typhoid pleurisy, that it is only by physical signs that the disease can be recognized.

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* Cyclopædia of Practical Medicine, article Empyema: also Professor Chomel, Dictionnaire de Medicine, art. Pleurisie. This eminent and accurate observer's experience coincides with that of Dr. Townsend.

PHYSICAL SIGNS OF EFFUSION INTO THE PLEURA.

The physical signs of pleurisy, in its different stages, will be easily intelligible, if we arrange them in the following manner :

1st. Passive auscultatory signs. Loss of sonoriety of the chest.

2nd. Active auscultatory signs.

a. Phenomena of respiration.

b. Phenomena of voice.

3rd. Signs of liquid accumulation, causing compression and displacement.

a. Of the ribs.

b. Mediastinum and heart.

c. Intercostal muscles.

d. Diaphragm and abdominal viscera.

The earliest sign is loss of sonoriety of the portion of the chest, corresponding to the effusion. This dulness, supervening much more rapidly than in ordinary pneumonia, and unaccompanied or unpreceded by the crepitating rale, generally points out pleuritic effusion.

When describing pneumonia, I showed that the occurrence of dulness, without preceding crepitus, was not, as Laennec has taught, necessarily indicative of pleurisy, as it was met with in the typhoid solidity. The constitutional state of the patient, the expectoration, and the absence of the signs of displacement, will, in general, suffice to distinguish this typhoid solidity from a pleuritic effusion.*

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* The following is the statement of Laennec on this subject. "This complete disappearance of respiration, after the existence of disease for a few hours, is quite pathognomonic of pleurisy with copious effusion, whether there exists pain in the side or not. In pneumonia, the disappearance of the respiration is gradual, and is perceived to be unequal in different parts of the chest; it is scarcely ever quite wanting below the clavicle; and when this takes place, it is not till after

The dulness is first perceived in the postero-inferior portion, and in the earlier periods is more valuable when occurring in the left than in the right side ; it extends upwards, engages the lower portion of the side and infra-mammary region ; and as the effusion advances, may extend to the scapular ridge, or anteriorly to the third rib. I have even seen universal dulness produced by a comparatively recent effusion.

In the early periods of the case, and before adhesions occur, the lung, as it were, floats on the fluid, which is permitted to pass freely around it. Hence is derived the interesting sign of variations in the sound on percussion, corresponding to the position of the patient. Under these circumstances, we may find that when the patient turns on his face, the postero-inferior portion, which had been dull, becomes clearer ; and in a few instances I have observed a return of clearness to the lateral portions when the patient turned on the opposite side, so as to allow the fluid to accumulate along the mediastinum. But these signs, although so satisfactory and unequivocal, are by no means so often met with as might be expected : and I have long believed that the change of situation of the fluid is prevented by an agglutination of the pleuræ, sufficient for this purpose, though yielding to the gradual accumulation of fluid. The sign, however, is a favourable one ; and the more so in proportion to the chronicity of the case, as showing but a small amount of effusion, and a sub-acute

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some days, or even weeks. It is further preceded for twenty-four or thirty-six hours by the crepitous rhonchus, which is quite characteristic. In pleurisy with copious effusion, on the contrary, the loss of the respiratory murmur is sudden, equable, uniform, and so complete, that no effort of inspiration can render it perceptible."—FORBES's *Translation*, 1834, p. 465. In his excellent article on pleurisy, Dr. Law makes the same statement :—" We may state that the sudden, equable, and uniform absence of respiration, and dulness of sound, are peculiar to pleuritic effusion."—*Cyclopædia of Practical Medicine*. In Dr. Hudson's paper on Typhoid Pneumonia there are some interesting examples illustrative of this point.—See Dublin Medical Journal, vol. vii.

inflammation. We must, then, admit with Piorry,* Reynaud, and Forbes, that the opinion of Laennec, with respect to the immobility of the fluid in pleurisy, was incorrect; but it is certain, as I have before stated, that the sign is not so frequent as we might *a priori* expect.

The dulness is generally complete; and when the effusion is partial, terminates by a well defined line, a circumstance which is never observed in progressive pneumonia. At this line, particularly in cases of absorption, I have sometimes observed the *bruit de pot felé;* but I do not know whether this is the same as the *son humorique* observed by Piorry in hydro-pneumothorax.† I do not recollect any case in which the distention of the stomach produced the peculiar tympanitic sound which occurs in hepatization.

I have already stated that when the effusion is copious, the entire side may be dull from the clavicle down. I have seen this to coincide with but little distress, and mild constitutional symptoms. Under these circumstances, the respiration may be extensively bronchial, or feebly vesicular in the upper half of the thorax; and in consequence of the displacement of the mediastinum, the dulness extends beyond the mesian line.

This extensive dulness is often, as Piorry has remarked, a precious sign of pleuritic effusion.‡

ACTIVE AUSCULTATORY SIGNS.—We shall first examine the phenomena of respiration, and afterwards those of voice.

With reference to respiration, the cases may be divided into four classes. In the first, all respiratory phenomena disappear over the dull portion of the chest; in the remaining portions, the respiration may or may not be puerile.

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* De la Percussion Mediate, etc. etc. Paris, 1828, page 80. The author well remarks, that Laennec, when speaking of egophonia, admits the change of position of the fluid. But, even in recent pleurisies, the sign is rarer than M. Piorry teaches.

† Op. Cit. p. 93.

‡ Op. Cit.

In the second, a feeble respiratory murmur may be extensively heard, gradually diminishing as we approach the lowest portion of the thorax.

In the third, a feeble murmur is heard only along the spinal column, as observed by Laennec.

In the fourth, an extensive and well marked bronchial respiration, most audible in the posterior and lateral portions, is heard from an early period.

Of these cases, the two last always coincide with extensive dulness on percussion.

The sign of bronchial respiration has been considered too much as peculiar to solidity of the lung. It is by no means uncommon in pleuritic effusion, and may be observed in the most recent as well as in chronic cases. Its mechanism is not yet understood. In two cases observed by Dr. Graves, the usual phenomena of pleurisy were so well marked, and the cases of so urgent a nature, that paracentesis would have been performed but for the occurrence of this bronchial respiration, which was to be heard distinctly over the anterior portion of the chest, particularly in a line drawn vertically through the mammary region; the same was observed posteriorly above and below the scapular ridge, and no where was the sound of respiration absolutely null.

These phenomena occurred in two cases, and on dissection the appearances were almost precisely similar in both.

A very strong and uninterrupted adhesion extended from about two inches below the clavicle of the affected side, in a line passing through the middle of the mammary region, nearly to the bottom of the anterior part of the lung.

This adhesion, about two inches in breadth, was very firm and close, so as to form an intimate union between the pulmonary substance and the anterior parietes of the chest, and extended nearly from the apex of the lung to its base. Along this line, the pulmonary tissue formed a plate of compressed lung, about two inches in thickness, which, like a vertical partition, divided the pleural cavity into two chambers, each filled with sero-purulent matter, and separated by the lung extending from its root to its anterior adhesions.

It is to be observed, that these two cavities communicated towards the clavicle, where the adhesion was wanting, and were still further divided by other adhesions posteriorly, extending upwards from the root of the lung to the superior lobe.

The lung forming these different partitions was red, compressed, and totally destitute of crepitus. The air cells were rendered impermeable by the pressure of the pleuritic effusion; but the bronchial tubes were not obliterated, and could easily be traced to within a line or two of the parietes of the chest.*

In a remarkable case of empyema which I have seen, a somewhat similar state of parts occurred. A musket-ball had penetrated the lung from above, downwards and forwards, entering at the supra-spinous region, and lodging at the anterior attachments of the diaphragm. A violent pleuritis, followed by copious effusion, was the result; and after a few days the heart was displaced. In this case, as in the two former, the occurrence of intense bronchial respiration posteriorly created doubt as to the nature of the disease, which was supposed by some to be hepatization of the lung. The knowledge of the two preceding cases, however, and the fact of the dislocation of the heart, made me conclude that the case was one of empyema, notwithstanding the singular circumstance of the side being much contracted. On dissection, a vast quantity of pus was found in the pleura; the trajet of the ball formed a long funnel-shaped cavity, distended by purulent matter, and inferiorly communicating with the pleural sac by a wide opening. The lung adhered along the mediastinum; and in the upper and lateral portions, its tissue was much condensed.

Thus, we have three cases in which the sign of bronchial respiration coincided with a bilocular empyema, with consolidation and adhesion of the lung; but that it may occur without any such physical conditions, I have no doubt, as I have frequently found it at a very early period in persons before healthy, and in whom the inflammation was of an acute character.*

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* Dublin Hospital Reports, vol. v.

In these cases a speedy recovery followed; and it seems probable that we must consider bronchial respiration as a favourable sign in pleurisy, as shewing that the lung is not wholly condensed, but admitting some passage of air into the cells.

The bronchial respiration of pleurisy is to be distinguished from that of pneumonia by its concomitant signs. The absence of rale, and the concurring signs of displacement, are those on which we are most to rely. Its disappearance in pneumonia is generally accompanied by the crepitus of resolution; but this is, of course, absent in pleurisy.

PHENOMENA OF VOICE.—I have little to add to the observations of Laennec on this subject; but I quite agree with Andral, that the word egophonia is but a generic term, under which must be comprehended numerous modifications of sound, in which the voice has a peculiar vibratory character. In some, the peculiar vibration accompanies every word of the sentence; in others, only certain words have the peculiar thrill; while in a third class, it is only heard as a sort of echo, at the end of particular words. These phenomena are always best heard about the scapular regions. I have never heard them in the lateral or anterior portions. They may be heard in the earlier periods of the case, or persist throughout to the fatal termination, as in the case recorded by Andral.† In many instances we never find them, and even when present they are extremely inconstant, and, taken alone, have but little value in diagnosis. It must always be recollected, that between the egophonic sounds and those from hepatization, there is often the closest resemblance; indeed, in a few cases of pneumonia, in the stage of resolution, I have found an almost perfect egophonia: these signs, too, are frequently absent, and may even mislead from the circumstance that some persons have a voice naturally egophonic. In such cases, before determining as to the morbid sign, the sound of the voice, heard without the stethoscope, and its characters over the healthy portions of the lung, must always be observed.

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* Andral has noticed the occurrence of bronchial respiration in pleurisy, and attributes it to the condensation of the air vesicles by the pressure of the fluid; but we have still to learn why the phenomenon is not constant.

† Clinique Medicale, Maladies de Poitrine, tom. ii. obs. xxi.

The pectoriloquism of phthisis, and the egophonia of pleurisy, are the least valuable of the physical signs of these diseases.

There is another phenomenon of voice, however, of far greater value. It is a negative rather than a positive sign. We find, where a quantity of fluid has been effused sufficient to give dulness, that when the hand is placed over the affected side while the patient is speaking, no vibration is observed; or if it be present, that it is singularly diminished. In this way, by placing a hand under each scapula, we can detect a pleuritic effusion by the absence of vibration over the dull portion.* It is an exceedingly useful sign, and assists much in the diagnosis of pleural effusion, hepatization, and enlargement of the liver. In the second case, however, I have found, although broncophony existed over the dull portion, yet that the vibration perceived by the hand, was less distinct than on the healthy side. Hepatization of the lung seems to diminish, but not remove this vibration.

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* This observation was first made in this country by Dr. Hudson, and published by me in 1833, in my Researches on the Diagnosis of Empyema, Dublin Medical Journal, vol. iii. The discovery of the sign, however, is due to M. Reynaud, of whose researches neither my friend Dr. Hudson nor myself were aware at the time above mentioned. The observation in question, with others of importance, will be found in M. Reynaud's Inaugural Thesis, Paris, 1819. In most cases where the lungs are free from disease, the vibrations of the right lung will be found stronger than those of the left, and corresponding with the greater resonance of voice. In a few, however, the vibrations are equal; and I have observed some cases in which there was the greatest resonance on the side where there occurred least vibration, as perceived by the hand.

In the case of enlarged liver, we may have considerable dulness, the vibration continuing ; yet, in extreme cases of enlargement upwards, it is probable that the sign would not apply.

Lastly, we find that this test is inapplicable in many cases of females, and boys, previous to the change of voice. In these subjects the vocal vibrations, although audible, are not sufficiently powerful to be felt by the hand.

SIGNS OF EXCENTRIC DISPLACEMENT.—We shall examine these signs in the order already stated.

DILATATION OF THE SIDE.—This sign, which is to be ascertained by measurement and inspection, may be observed at a very early period of disease. Laennec has found it distinct after two days' illness; Andral on the fourth or fifth day. I have never observed it at so early a period ; but often within the first fortnight. Its greatest amount seems to be within two inches. *It may exist without protrusion of the intercostal spaces ;* a fact which I have recently ascertained, and which is opposed to the statements of Andral, who describes the dilatation as always existing with this condition. I shall recur to this point when on the differential diagnosis, particularly with reference to the case of enlarged liver. But dilatation of the side is by no means a constant sign, even where copious effusion exists. The lung may be compressed, and the heart displaced, without any notable amount of dilatation.

I have ascertained from a number of observations, that the right is often larger than the left side. The average result of the most accurate measurements of twenty chests of persons not labouring under lung disease, gave for the right side 17.86 inches ; and for the left 17.23, or more than half an inch in favour of the right lung. Of these, the most capacious chest measured 22 inches for the right ; and 21.50, for the left. In one case only was the left side larger than the right ; and in three, the sides were symmetrical.

In the case of greater development of the left side, the man was left-handed; and the left biceps measured half an inch in circumference more than the right.

This greater development then of the right side must be always borne in mind; and we deduce two practical rules from these observations:

First, that the sign of dilatation is more valuable, as indicative of empyema of the left than the right side.

Second, that in empyema of the right side, we are not to place confidence in the occurrence of dilatation, unless it is more than half an inch.

For measuring the chest, a good instrument is the graduated tape, coiled in a metallic box by the spiral spring. The apparatus, however, which I have employed, is a pair of broad steel callipers, something of the shape of the ogee arch; the blades are connected by a hinge at the upper extremity, and at their lower extremities terminate each in a wooden ball; a graduated arc, fixed on one blade, passes through an eye in the other: each of its divisions corresponds to an inch of distance between the balls; these divisions are subdivided into tenths. Above the graduated arc, and attached by a hinge to the blade of the instrument which receives its fixed end, is a cylindrical brass box of about an inch in length, containing a spiral spring attached to a sliding bar, also passing through an eye in the opposite blade. By means of a screw passing through the latter, the bar can be fixed at any point desired, so that when the instrument is extended, the spiral spring acts in keeping the falls fixed with an equable force to each side of the chest.

By this instrument we can accurately measure, not only the depth of either side, but the amount of expansion at each inspiration.

Displacement of the Heart.—This important sign occurs from the earliest periods, and exists long before any protrusion of the intercostals or diaphragm. In effusions of the left side, the heart crossing the mesian line, is a phenomenon so singular, as commonly to awaken the attention of the patient; and is one of the circumstances which render the discovery of empyema of the left side more easy than that of the right, in which the heart may be scarcely altered from its position, or if it be, its movement for an inch or so more to the left often escapes observation.

There is nothing more interesting than to follow the displacement of the heart, in effusions of the left pleura: we observe, first, that the apex strikes in a situation about midway between its natural position and the upper portion of the xiphoid cartilage. As the distention goes on, the heart buries itself under the sternum, and its impulses for a time are greatly diminished, and have wholly disappeared from their natural position: presently the heart reappears from the right side of the sternum and then pulsates between the fifth and seventh ribs, at about an inch from the sterno-costal articulations; the pulsations are often visible, and the patient conscious that the heart is displaced. The hand, applied under the left mamma, perceives no impulse whatever, but the sounds are generally feebly audible, increasing in loudness as we carry the stethoscope upwards and across the chest, till we arrive at the situation of the heart, where they are at their maximum.

The experience of upwards of twenty cases has convinced me, that this dislocation of the heart, even when at its greatest degree, does not cause any alteration in the natural sounds of the organ; indeed it is singular how little its action is excited in many of these cases. In two instances I have observed the dry pericarditis to supervene in the last stages of empyema. The friction signs were evident, but the action of the heart was scarcely excited.

Displacement of the heart to the right side by no means implies complete obliteration of the left lung, on the contrary, the upper lobe may present distinct vesicular murmur, while the heart pulsates to the right of the sternum. I have also observed extensive bronchial respiration in these cases.

It appears to me that Laennec, and most subsequent writers on auscultation, have paid too little attention to this sign, which, from its frequency of occurrence, and facility of recognition, forms the most important of the signs of excentric displacement.*

I have observed, that during recovery the heart returns to its natural situation with great rapidity, and long before the posterior and lateral portions of the side have become clear on percussion.

To Dr. Townsend is due the merit of first observing, that in copious effusions of the right pleura, the heart may be pushed towards the left axilla. In a case of pleuro-pneumo-thorax of the right side, he saw and felt the heart pulsating between the fourth and fifth ribs, near the left axilla, from which it gradually returned to its natural position, as the pressure was removed by drawing off the fluid from the opposite side.†

When describing the phenomena of absorption, I shall notice the interesting fact, which I have lately observed, of *displacement of the heart to the right side, in consequence of the absorption of an effusion into the right pleura.*

From our knowledge of displacements of the heart, we might anticipate that the mediastinal protrusion could be ascertained by percussion, and thus a diagnosis be drawn between the accumulation of fluid, and solidification, without change of volume: this is what really occurs; and the dulness in the first affection extends beyond the mesian line, and this even in the upper sternal region. As in the dilatation of the air cells we may have morbid clearness beyond the mesian line, so in empyema, the mediastinum being displaced by liquid, dulness extends as far as the mediastinal displacement.

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* It is not alluded to by Laennec in his account of the signs of pleurisy; he mentions it incidentally under displacement of the heart: Andral has observed a single case of it. Dr. Townsend, in the Cyclopædia of Practical Medicine, in his articles on Empyema and Displacement of the Heart, dwells strongly on its importance.

† Cyclopædia of Practical Medicine, Art. Displacement of the Heart.

Displacement of the Intercostals.—After a certain period, shorter in proportion to the violence of the disease, we find the intercostal spaces becoming obliterated; the side becomes smooth, and this, when the patient is emaciated, contrasts remarkably with the appearance of the opposite ribs. I have never found the intercostal spaces to rise beyond the ribs, as described by some authors, unless when an empyema opened externally.

This smoothness of the side seems peculiar to pleurisy in its advanced stages; it is not met with in the earlier periods of the disease: *and an effusion, sufficient to dilate the side and displace the heart, may exist for weeks without producing it.* It is not met with in Laennec's emphysema, in pneumonia, simple hydrothorax, or enlargement of the liver, and hence becomes one of the most valuable of the physical signs of advanced pleurisy.

It must always, however, be borne in mind, that it is not necessarily present in cases with even a copious effusion.

On the absorption of the fluid, the intercostal depressions again appear; but for a length of time the action of the muscles continues feeble. I have often thought that at this period we might, by electricity, more rapidly remove the paralysis produced by inflammation.

Displacement of the Diaphragm.—The protrusion of this muscle follows the same course, and is influenced by the same laws, as that of the intercostals. We recognize it by examining the upper portion of the abdomen, which is then found full and resisting. If the empyema be of the right side, the liver is pushed downwards, forwards, and across the abdomen; if of the left, the spleen is displaced. Of the first I have seen many examples; but of the second I have no experience.

When the liver is displaced, we find a tumour in the right hypochondrium, answering to the volume of the liver, and often accompanied by a distinct sulcus immediately below the ribs, and above the upper boundary of the tumour. This results from the space left by the touching of the two convex bodies, namely, the upper portion of the liver and the protruded diaphragm. On the absorption of the fluid, the liver ascends, and the sulcus disappears.

This observation which I first made in 1832, has assisted me in the diagnosis of several cases. But the disappearance of this sulcus does not necessarily imply the ascent of the liver to its natural position, *for the organ may yield to the pressure of the diaphragm, and become deeply concave on its upper surface.* This interesting circumstance occurred in a case where the liver was softened and engorged; so that the rule is, that the disappearance of the sulcus is only favourable when accompanied by the ascent of the hepatic tumour.*

PHENOMENA OF ABSORPTION.—When the effusion has caused dulness so high as the scapular ridge or clavicle, its removal is first pointed out by alterations in the respiration, which may occur while the sound continues dull. If respiration has been absent, a feeble but increasing murmur appears in the upper portions of the side, both anteriorly and posteriorly; this gradually spreads downwards, and may become universally, though feebly audible, even though the side continues extensively dull: should bronchial respiration have existed, the character of the sound is first lost in the portions of the lung furthest removed from the root; here it passes into the vesicular murmur, and every day its situation becomes more and more circumscribed, by the advance of vesicular murmur towards the centre.

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* For full particulars of these observations, I beg to refer to my papers on the Diagnosis of Empyema and Pericarditis, Dublin Journal of Medical Science, vols. iii. and iv.

In recent and sub-acute cases, clearness on percussion generally coincides with the return of respiration: in such cases the friction sounds are generally audible, and the vibrations can be perceived over an extensive surface. The more rapid the absorption, the greater the probability of these phenomena existing. In some cases, however, where the effusion seemed to be principally serous, I have observed its rapid absorption without consequent friction signs.

Let us now study the phenomena of absorption as connected with the situation of the heart.

When an effusion into the left pleura, sufficiently copious to displace the heart to the right of the sternum, begins to be absorbed, the organ retraces its steps, and returns, often with rapidity, to its normal situation. I have twice seen this to occur within four days. The dulness of the sternum subsides, and we have no longer the signs of mediastinal displacement. But this return of the heart by no means implies the complete removal of the effusion, for it will be commonly observed, while dulness continues up to the third rib.

In cases of complete absorption, we may observe variations with respect to the position of the heart. In some its apex strikes in the original situation, while in others the organ remains manifestly closer to the sternum. This difference depends on the rapidity of absorption, and the circumstance of contraction of the chest; for, where this occurs, the heart is approximated to the sternum.

No observations have been as yet recorded, illustrative of the effect on the heart by the absorption of effusions into the right pleura. I have ascertained, however, that this circumstance may so modify the position of the heart, as to cause its extensive displacement, and thus produce the singular phenomenon of the displacement of the heart to the right side, consequent on the removal of an effusion of the right side. Of this the following case is a most interesting illustration.

A man, aged 40, was admitted into the Meath Hospital in December 1835, labouring under pleuro-pneumony of the right lung of five days' standing. On the seventh day, the signs were those of a copious effusion into the pleura; he complained principally of pain in the shoulder; a puffy swelling occupied the right sterno-clavicular articulation, the clavicle was dislocated forwards, and for several days its sternal extremity could be moved upwards and downwards. On the eighth and ninth days, a distinct crepitus existed over the postero-superior portion of the side. The patient had become affected by mercury, his fever had subsided, and on the thirteenth day of his illness the following observations were made.

The left side was every where clear, even over the left mammary region, where no pulsation could be felt.

The right mammary, lateral, and postero-inferior portions of the right side sounded completely dull, respiration being absent, the upper portions were tolerably clear, and with a feeble murmur mixed with rale in the sub-clavicular, axillary, and supra-scapular regions. The sounds of the heart were distinctly perceptible in the right mammary region. On the eighteenth day the heart could be seen and felt pulsating to the right of the sternum, in the fourth and fifth intercostal spaces; here the sound was completely dull, and without any rale or vesicular murmur; the left mammary region was perfectly clear on percussion, and the heart's impulses were here quite imperceptible. In the course of the next week the respiration had returned to the upper, middle, and lateral portions of the right side; and although the heart's action was less excited, its situation obviously remained unchanged. Up to the period of death, no bruit de soufflet or morbid sound accompanied its actions; the right side recovered its sonoriety, *with the exception of the mammary region, which, over a space exactly* *corresponding to the size of the heart, remained perfectly and permanently dull.*

The patient became affected with mercurial eczema, after which he fell into a cachectic state, with frequent diarrhœa: under careful tonic treatment he at last seemed to improve, when the head became suddenly engaged, and he died in two days, with all the symptoms of violent arachnitis. From the invasion of the first disease to his death, about eight weeks intervened.

Not having seen this patient during the first periods of his illness, I experienced difficulty in determining the nature of the displacement of the heart. Physical signs showed that it was not owing to any accumulative disease of the left lung or pleura. Here there was no emphysema, no tumour, pneumo-thorax, or liquid effusion. The question naturally arose, was it a case of congenital displacement, in which the heart had remained at the right of the sternum, unknown to the patient, and only made evident by the excitement of disease. This question was settled by reference to a principle never before employed in such a case. In every recorded instance of congenital displacement there has been a universal transposition of viscera, the stomach occupies the right, and the liver the left hypochondrium. The case was investigated with this view, and no evidence of any hepatic tumour in the left side could be detected; and although it was somewhat difficult to ascertain the presence of the liver in its natural situation, yet I was satisfied that it was not transposed.

We could only then conclude, that in consequence of the rapid removal of the effusion, (no time being allowed for contraction of the chest, while the lung, probably from its inflamed state, or being bound by adhesions, could not again fill the cavity of the chest) the heart had been drawn across the mesian line, and the left lung enlarged, so as to assist in occupying the vacant space. This novel diagnosis proved to be correct; the right lung was found permeable, but reduced to less than a third of its natural volume. The pleural cavity was obliterated, and a large quantity of coagulated lymph occupied the lower and posterior portions of the side. In this effusion a purulent collection of about an ounce, apparently the last remains of the empyema, existed. The heart lay to the right of the sternum in a transverse direction, and its base corresponded to the fourth and fifth ribs; it was perfectly healthy; the left lung was much enlarged, and stretched far across the mesian line: no lesion of its structure could be detected.*

Thus while empyema of the left side forces the heart to the right of the mesian line, the rapid absorption of an empyema of the right side draws it in the same direction. This circumstance is obviously favoured by the rapidity of absorption, when there is not time for the side to contract. It will be probably found to occur more or less in many cases, but particularly in those of the combination of an acute or chronic disease of the lung, with a pleuritis, the effusion being rapidly absorbed.†

Since the foregoing observations were made, it has been suggested to me to consider how far the case of probable dislocation of the heart from external violence, which I published in 1831, might be similar to that now recorded. The question is a difficult one, but as the two cases should be studied together, I shall abridge my observations from my original paper.

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* This important case was seen by several of my professional friends, I would particularly specify Dr. Benson and Dr. Corrigan.

† The following references to cases of congenital transposition of viscera will be found useful:—*Schenckius*, Obs. Med. Rar. 1600. *Riolanus*, Raræ Obs. Anat. Paris, 1649. *Porquet*, Experiment. Novæ Anat. Paris, 1654. *Stoll*. De Medicina. *Winslow*, Mem. de l'Academie, 1743. *Næguart*, and *Piorry*, Journal Generale de Médecine, 1820. *Beclard*, Bulletins de la Faculté de Médecine de Paris, 1816. *Dubled*, Archives Generales, tome vi. 1824. *Billard*, Maladies des Enfans nouveau-nés. *Berard*, Dict. de Médecine, tome viii. *Bouillaud*, Traité des Maladies du Cœur. *Houston*, Descriptive Catalogue of the Museum of the Royal College of Surgeons in Ireland.

A gentleman, aged 21, was on the 7th of May, 1822, crushed by a water-wheel of great size; he received the blow in a line running from the inferior angle of the left scapula to the top of the right shoulder. The thorax was fearfully crushed, two ribs in the lower portion of the left side, and the fifth, sixth, and seventh of the right side were broken, as were also the right clavicle and humerus. The right side was emphysematous, with complete paralysis of the arm. The patient felt great pain, accompanied by violent throbbing in the right side, and on the third day pointed out to his physician, that his heart was pulsating to the right of the sternum. No symptom of inflammation occurred at the left side.

I first saw this gentleman in 1830. Since the accident the heart had continued to pulsate at the right of the sternum; the pulsation being generally violent, and aggravated by mental emotion, or exercise. He has had every winter inflammatory attacks, with violent pain of the left side, and great increase of dyspnœa, and palpitation. These attacks were only relieved by bleeding. Cold applied to the arm or chest always produced a feeling of suffocation, and he found that vomiting followed the use of food if taken when the dyspnœa was urgent. The act was productive of great pain, with straining in the right mammary region, and excitement of the heart. His habit of body was spare, but muscular, nor was the countenance expressive of disease. A hard sonorous cough had continued ever since the accident, with exacerbations, during which his breathing becomes tracheal. His pulse varied from 100, to 120, unless when he took digitalis.

The following was a report of the physical examination on my first seeing the patient.

The right shoulder was depressed, but the right side inferiorly was dilated more than an inch.

The left side of the thorax sounded perfectly clear even to its most inferior portion, and in the situation naturally occupied by the heart. Puerile respiration, mixed with bronchial rales, was to be heard over the entire lung, as distinct in the mammary region as in the other portions. The sound of the heart was scarcely audible in the upper part of this side, *but neither sound nor impulse was perceptible below the mamma.*

The upper portions of the right lung sounded clear, but from the fifth rib downwards there was complete dulness, and here the integuments were exquisitely sensible. In the upper portion, both anteriorly and posteriorly, the respiratory murmur was of the same character as in the opposite lung, but from the fifth rib downwards it was wanting, except along the spinal column, where it could be heard feebly. There was no bronchial respiration or resonance of the voice.

The pulsations of the heart were felt and seen in the right mammary region, and within an inch of the sternum. When not over excited, its sounds were scarcely different from those in the healthy state. The impulse preceded the pulse at the wrist by an appreciable interval.* There was no sign of valvular disease.

It is now fifteen years since the accident, and the patient enjoys excellent health, with the exception of attacks of bronchitis, which are not severe, but which are accompanied with a tracheal breathing. He derived the most remarkable advantage from the use of the seton over the heart; and since then, for several years, the excited action has subsided. He has been able to give up the use of digitalis, and to enjoy field sports, and take the most violent exercise. The physical signs have continued the same, with this difference, that the puerility of respiration has subsided, the action of the heart is tranquil, *and there is no difference of measurement of the sides of the chest.*

It must be admitted that the facts which the first case of

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* See a paper by myself and Mr. Hart in the Edin. Med. and Surg. Jour. for October 1830; also Dr. Corrigan's able paper in the Irish Medical Transactions of the same year.

Dexocardia has taught us, throw increased difficulty on the diagnosis in the one now detailed. It is clear, either that the pericardium had been ruptured, and the heart forced into the right pleura; or that, in consequence of the rapid absorption of an empyema of the right side, it had been drawn across. But the positive affirmation of the patient, that the heart was felt pulsating to the right of the sternum on the third day after the accident, and the singular and anomalous symptoms observed in the progress of the case, are strongly in favour of the first view taken, namely, that a traumatic dislocation had really occurred.*

With relation to the modified position of the heart after the cure of empyema, I have lately made the following interesting observation. A gentleman, aged twenty, recovered from acute empyema of the left side. The heart had been pushed far to the right, but returned to its former position early in the progress of cure. It is now three months since he recovered, with a clear sounding chest. From this time he observed, that whenever he turned on the right side, the heart seemed to fall over, and pulsate at the right of the sternum. This curious phenomenon still continues. In the erect position, the heart occupies a situation midway between the usual position and the sternum; but when he turns on the right side, immediately the pulsations can be felt to the right of the sternum, whilst they cease at the left side. The sound on percussion, too, varies with the position of the heart. In this case, there can be no doubt that the mediastinum, stretched by the empyema, has not recovered its tone, and permits, by its extension, this extraordinary change of the situation of the heart.

Contraction of the Chest.—I have known many cases of pleurisy to recover, without contraction of the side, or depression of the shoulder: these were cases of sub-acute inflammation, or where the effusion had been rapidly removed. In other instances, the contraction has been confined solely to the lower portion of the chest, while the shoulder was not depressed: and in several, where the disease occurred in young persons, the deformity was either removed in process of time, or so much diminished, as to be scarcely perceptible. I have had no experience as to the connexion of this termination, with the hæmorragic pleurisy, on which Laennec has dwelt so strongly: on the contrary, it appears to me, that the more violent the inflammation, the greater is the probability that contraction will accompany the cure; and it seems likely that the paralysis of the intercostals and diaphragm, by interfering with the expansion of the side, has an immediate effect in producing this result. We must agree with Dr. Forbes, that this deformity is not the consequence of hæmorrhagic pleurisy exclusively; but that it is a common termination after the removal of purulent effusions, whether by absorption or operation. And if other evidence was wanting, we have it in the analogous contraction in chronic pneumonia and phthisis.*

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* For full details of this case, see the Edinburgh Med. and Surg. Journal, No. 108.

The return of a dilated side to its natural circumference is sometimes exceedingly rapid. I have known a dilated side to lose as much as an inch and a half in eight days. In some, the contraction is shewn merely by the flattening of the anterior portion, causing visible deformity, yet with but little alteration of size. In others, the affected side becomes of a triangular form, the base of the triangle corresponding to the mesian line, and the apex to the centre of the ribs. Even this condition, when occurring in the young person, may be much improved by time.

One of the first signs of the absorption, with contraction, is the increased prominence of the inferior angle of the scapula.

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* See his original cases for two instances of contracted chest. Dr. Forbes refers to Dr. Hastings' valuable paper on empyema, Edinburgh Jour. of Medical Science, No. 1. To cases by Baron Larrey, Journal Comp. de Sc. Med. 1820. And to Mr. Jowell's case, Med. Chir. Rev. 1826; in which, as I have observed, the contraction was partially removed in the progress of cure.

I have known the dulness consequent on the cure of a former pleurisy, to be mistaken for that of recent hepatization. Fever, with slight bronchitis, had supervened. The dulness was discovered, and no farther examination, either into the history or accompanying signs, being made, the most improper treatment was pursued.

But contraction of the chest, in connexion with empyema, may occur under circumstances very different from those described by Laennec and subsequent authors. *It may coincide with an increasing empyema, and occur at a very early period of the case.* This interesting circumstance I have known to occur in two cases. In both, pleuritis with effusion followed on injury, and long after effusion there was exquisite pain whenever the patient attempted to expand the side. In one case the patient, up to the period of death, kept himself strongly bent on the affected side; so that the case presented the singular combination of a vast empyema, with extreme contraction of the affected side.

DIFFERENTIAL DIAGNOSIS.—The diseases with which a pleuritic effusion is commonly confounded, are the following:

1st. Tubercle of the lung.

2nd. Pneumonia, in the stage of hepatization.

3rd. Enlargement of the liver.

Nothing is more common than the error of taking cases of pleuritic effusion for pulmonary tubercle. The patient may recover, or die of tubercle, consecutive to the absorption of the empyema. In the first case, the physician felicitates himself on the cure of a consumption; in the next, on the accuracy of his diagnosis. In both instances he is mistaken.

The cases generally mistaken for phthisis are of two kinds; there is either a circumscribed and chronic effusion, which may exist without much excentric displacement; or there may be a copious sub-acute effusion, compressing the lung, and occurring in the lymphatic subject.

In the first case, we generally find that the health does not suffer in proportion to the extent of disease, as indicated by the stethoscope. The dulness is complete, as is also the absence of rale, and often of respiration ; and when these signs occur in the lower portion of the chest, we have a group of circumstances quite unlike the phenomena of phthisis.

I have seen several examples of the second case. A child of a lymphatic temperament is attacked with pain of the side, fever, and cough. Phthisis is apprehended, and after a fortnight or three weeks the whole side is discovered to be dull, and tubercle is diagnosticated with mistaken certainty. The following circumstances should correct this error.

1st. The absence of the usual constitutional suffering, in cases of acute phthisis.

2nd. The fact of complete dulness of the side occurring in so short a time.

3rd. The lung being impermeable, except perhaps in the upper portion, where a feeble murmur, without rale, can be heard.

4th. The signs of mediastinal displacement.

In the sub-acute cases, the signs of diaphragmatic or intercostal displacement are often wanting.

HEPATIZATION OF THE LUNG.—The case of pneumonia most likely to be confounded with pleuritic effusion, is the rapid typhoid solidity already described. In the ordinary variety, however, a doubt sometimes exists as to whether the signs proceed from effusion or solidity. In a case seen for the first time, with the previous history of which we were unacquainted, presenting bronchial respiration, and with an effusion just sufficient to compress the lung, without displacing the mediastinum or side, there might be a difficulty. But such a case is rare ; and in the majority of instances, *the phenomena of voice, and the existence at all periods of some form of crepitating rale, in conjunction with bronchial respiration,* will distinguish pneumonic solidity from liquid effusion.

ENLARGEMENT OF THE LIVER.—An enlarged liver may dilate the side, and cause dulness of sound up to the fourth rib; in most cases, however, the dulness only extends to a little above the mamma. The following circumstances will assist in diagnosis.

1st. The absence of intercostal paralysis or protrusion.

2nd. The clearness, on percussion, of the upper and middle portions of the chest.

3rd. The loudness of respiration in the postero-inferior portion, which is much greater than could be anticipated from the amount of dulness.

4th. The absence of lateral displacement of the heart, and the existence, in many cases at least, of the vertical displacement upwards. This is principally seen when the left lobe of the liver is engaged.

5th. The fact of the interlobular fissure being parallel with the mesian line; for, in displacement of the liver, the pressure being exercised on the right lobe, the interlobular fissure is directed towards the left side, and forms a considerable angle with the mesian line.

6th. We find in cases of hepatic tumour, without pleuritis, that the dulness of the postero-inferior portion of the side disappears on the patient taking a deep inspiration, returns upon expiration, and remains fixed during ordinary breathing. I have never witnessed this phenomenon in any case of empyema. I believe, however, that the test is not applicable when the lower portion of the pleura has been obliterated by adhesions.*

TYPHOID PLEURITIS.

A very close analogy exists between this affection and the typhoid pneumonia. Like that disease, it occurs in the debilitated, or broken-down habit; or is secondary to typhus fever, or some other morbid constitutional state. Pursuing the analogy, we find that it is generally latent, and often pointed out more by sinking of the powers of life than by any new suffering; that though forming suddenly, it is slow to be removed; that it is seldom uncomplicated, but rather one of many secondary lesions; that it is frequently combined with gastro-enteric disease; and that it does not admit of active antiphlogistic treatment.

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* I published most of these observations on the diagnosis between hepatic tumour and empyema, together with those on the hepatic sulcus, in 1833. See my Researches on the Diagnosis of Empyema, Dublin Journal of Medical Science, vol. iii.

In the first part of this section I have enumerated the principal circumstances under which we meet with typhoid pleuritis.

As a complication of essential typhus, this disease is rare. Louis* found out of fifty-seven cases, but one in which it occurred. I have seen but two well-marked examples of it. In both the disease set in during a severe typhus, and was pointed out by sudden and unaccountable sinking. In the first case, the effusion occurred on the sixth day, and occupied a large portion of the left pleura; no pain or distress of breathing accompanied the disease. The patient recovered from the fever, and the effusion was subsequently absorbed; his pulse, however, remained quick; cough appeared; and phthisis was apprehended. He was carried off by a sudden attack of encephalitis; and on dissection, the lungs were found to contain miliary tubercle, while the left pleura was obliterated.

In the second case, on the fourteenth day of a severe maculated fever, a sudden sinking was observed, and frottement discovered over the left side. On the next day, the patient, a young female, had the appearance of an individual in cholera; she had sweated copiously, and was covered with miliary eruption: there was severe orthopnœa, and she speedily sank. A double effusion had existed. The left pleura contained a large quantity of whey-coloured fluid; while in the right, the effusion was more sanguinolent and serous. In both, lymph occurred in a reticulated form over the whole serous membrane; and also in the pericardium.

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* Recherches sur la maladie connue sous les Noms de Gastro-Enterite, etc. Tom. ii. Paris, 1829.

Similar circumstances occur in puerperal fever. Dr. Lee mentions three cases in which the symptoms, during life, were exceedingly obscure, yet where copious effusions occurred, and the pleura was covered with false membranes. In one the pleura had given way by sloughing.* Similar appearances have been observed by other authors.

But it is in those morbid states of the system, which may be denominated the pyogenic conditions, that we observe this disease most frequently. It is common in the erysipelatous diseases, particularly of the low type; in purulent phlebitis, and in the diffuse inflammation. In these cases, purulent collections are commonly found in the pleura, although during life symptoms of pleurisy were either absent or very slightly marked. In a few instances, however, I have observed the invasion of the disease to be accompanied by severe pain.

There is an affection which may be termed typhoid arthritis, in which this secondary pleuritis is liable to occur. The late Dr. M'Dowel was, I believe, the first to describe this disease, of which the principal characters are,—the rapid tumefaction and suppuration of many of the larger joints, accompanied with a typhoid fever, and followed by affections of the brain, lungs, heart, or digestive system. In such instances, I have more than once observed purulent collections in the pleura, lung, and pericardium.†

As I have but little experience of cases of purulent collections in the pleura, consequent on surgical operations, and in which the disease is supposed to arise from absorption of pus, I shall not enter into the subject, further than to remark, that these visceral suppurations seem to me more the result of a pyogenic condition of the entire system, in the first instance, perhaps, induced by purulent absorption, but continuing and forming pus under the operation of a law of multiplication, similar to that in variola, in which, from infection or inoculation, the pyogenic diathesis is induced.

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* Cyclopædia of Practical Medicine, art. Puerperal Fever.

† On this subject, Dr. M'Dowel's important papers in the third and fourth vols. of the Dublin Journal of Medical Science ought to be consulted. No apology is necessary here for recalling the name and labours of my lamented friend to the mind of the student of medicine; his loss was a serious one to the school of Dublin. In him were combined the accomplished surgeon and the zealous pathologist. His papers in the Dublin Hospital Reports, the Transactions of the Asso-

We see these collections occurring in an equally sudden and extraordinary manner where no operation has been performed, and where the constitutional state precedes the formation of pus.

TREATMENT OF PLEURITIS.

The remedies in the earlier stages of acute pleurisy are few and simple. When the patient is of a robust habit, and the fever runs high, we must employ the lancet, and repeat its use according to circumstances : but we must be cautious lest we lower the strength too much ; and after the second bleeding, (if that should be necessary,) it will be better to trust to local depletion and other means. There is more danger from excessive general bleeding, in this disease, than in pneumonia. Repeated leeching, or cupping, must be employed not merely until the pain is reduced, but long afterwards, while the patient can bear the loss of blood. Large emollient poultices are strongly recommended by Broussais, and there can be no question of their efficacy. Warm and soothing drinks are to be used, and opiates administered : and we are to avoid the use of blisters, so long as the pulse continues hard, the pain severe, and the skin hot. The patient must be kept in a well aired but warm

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ciation of the College of Physicians, and lastly, in the Dublin Journal of Medical Science, will long remain evidences that he was not one of those who resisted improvement because it was new, or clung to error because it was convenient.

apartment, and the cough moderated by every means in our power.

It most cases it will be advisable to affect the system with mercury. The remedy is to be administered internally, or by inunction. The observations which I have made on this treatment in pneumonia apply equally to pleuritis.

The violent symptoms having been reduced, the effusion may be rapidly absorbed, and the sonoriety of the chest restored. But in most cases the constitutional symptoms and local suffering only, are removed, while the effusion continues stationary, or perhaps even on the increase. It is at this period that we derive most advantage from the study of physical signs. Then, by repeated counter-irritation, or even small local bleedings, followed by diuretics, we can generally succeed in effecting a cure.

TREATMENT OF SUB-ACUTE AND CHRONIC PLEURISY.

The physician will be frequently consulted by patients labouring under empyema of some standing. There is but little constitutional distress; yet the pulse is quick; the breathing hurried; and emaciation is going on. One side is found dull and dilated; the heart is displaced; and the respiration puerile in the opposite lung. In such cases, a cure may be effected by the following treatment:—

The patient must be confined to bed, and there remain for several weeks: this is a most important condition. His diet, for the first fortnight or three weeks, must be of milk, farinaceous substances, and vegetables. The bowels having been freely evacuated, an accurate measurement of the chest, above and below the mamma, is to be recorded; and the situation of the heart and extent of dulness, carefully noted.

Leeches are now to be applied to the affected side, even though the case be chronic, and no pain whatever exists. From six to eight will be sufficient at each application, which may be repeated every day, or second day, for the first week; during which time, mild mercurials are to be steadily exhibited, till a slight but decided ptyalism is induced. After the first week, we may begin with small blisters, which are to be covered with silver paper, and applied repeatedly over various portions of the affected side.

At the end of a week or fortnight, we shall often find that the line of dulness is subsiding, and that the heart has returned to its natural position. In some cases, however, even after ptyalism, there is no change in the physical signs; but the patient, notwithstanding, feels a degree of relief, which cannot be explained by the diminution of the effusion.

We are now (if fever be absent, and the pulse quiet) to slightly improve the patient's diet: we may allow light broths, fresh eggs, or perhaps a little chicken; and, with this change in regimen, we are to resort to diuretics, the success of which seems wholly to depend on our having, by the early treatment, subdued all inflammatory action in the pleura.

For diuretics, the infusions of juniper, or pyrola umbellata; combined with acetate, and nitrate of potass; the preparations of digitalis; and the spirit of nitrous ether may be employed.

But, in this stage, the remedy on which I have the greatest reliance is Iodine, employed internally and externally; a pint of Lugol's mineral water may be taken during the day; and from two drachms to half an ounce of the ointment rubbed daily over the side. The effect of this treatment in promoting absorption is sometimes singularly rapid. The medicine generally acts as a powerful diuretic, and is to be continued until all liquid is removed from the pleura, as shewn by the returning clearness, and the friction signs.

In a few cases the heart continues to act too strongly after the absorption. For this, the best treatment will be the application of a blister, and the exhibition of the medicinal hydrocyanic acid, or digitalis; followed by the application of a large belladonna plaster; and the patient for some time must avoid all unnecessary muscular exertions.

After the absorption of the fluid, it will be always right that the patient should go to the country; or if there already, that he should change his air. Nothing so distinctly promotes the organization of the false membranes as this.

I have now twenty cases of complete and permanent recovery from empyema by absorption. In two the effusion was comparatively recent, of not more than a few weeks' standing. In one recovery took place, apparently from the patient being sent to the country; but in the remaining twelve, paralysis of the intercostals had occurred, and in the majority the heart was greatly displaced. The treatment, as above, was pursued with scarcely any variation in them all, and with a success truly gratifying. In several of these cases the constitutions were decidedly scrofulous, and in these the convalescence was for a time doubtful. In such cases I would always recommend the use of the issue, and that the patient should pass the winter in some mild and sheltered situation.

In most of these cases, the patients were under thirty years of age; in three, below ten. In one which I saw along with my friend Dr. Beatty, the disease occurred during pregnancy; yet the lady bore the treatment well, and was delivered of a healthy child at the usual time, and has since remained well.

Should deformity occur, we may hope for its diminution by time. Carefully regulated gymnastic exercises might also be employed, and perhaps electricity, to restore the tone of the intercostal muscles.

From these facts we may safely conclude, in opposition to the experience of Willis,* Broussais, and Laennec, that the probability of a cure, and the efficacy of remedies, is much greater than has been supposed.

Operation for Empyema.—The results of the operation in empyema are anything but encouraging. This can be understood when we reflect on the following circumstances.

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* Willis, in his book De Empyemate, says: "*In tali casu pharmacia haud multum opus erit, sed tantum corpore preparatur illuc ad lateris apertionem procedatur.*

First. From the nature of an important operation, and the dread which it inspires, it is neither proposed nor submitted to, unless as a last resource; or in other words, when there is the least chance of success. This is not giving surgery fair play; all other means have failed, and this very failure shews an unfit state of the constitution. The disease has lasted for a length of time, the lung is compressed, atrophied, or bound down by adhesions, so that it cannot again fill the chest, and in consequence, the operation only substitutes a pneumo-thorax for an empyema.*

In the next place, and from the same circumstance of chronicity, there is, as we have seen, a probability that tubercle of the lung is forming, and the operation is often performed while phthisis is advancing.

Thirdly. Gangrene of the pleura not unfrequently follows the operation: supposing that this arises from the introduction of air, M. Roux injects water, so as to nearly occupy the space of the fluid withdrawn.

Fourthly, and lastly. It will be found that in a very large proportion of cases operated on, *the sound of fluctuation was heard,* proving that air as well as fluid existed in the cavity. These are not cases for operation, for although there is the possibility of air and liquid co-existing without a pulmonary fistula, yet it is certain that this occurs in the vast majority of cases. The existence of the fistula alone is a powerful argument against operation, as it so materially interferes with the re-expansion of the lung; but when we reflect that this fistula implies disease of the lung, and that this in almost every case is tuberculous ulceration, we can easliy understand the failure of the operation.

But that when performed with judgment, the operation has often succeeded, there can be no doubt. The cases which seem to demand it are those where a rapid acute effusion, threatening life, occurs; and next, chronic cases which resist treatment, such as I have described. But even in these cases, so long as life is not threatened, it seems much better not to operate, but rather give the patient the chance of the ultimate absorption of the fluid. That many of my cases would have been operated on by others, I have no doubt whatever. I shall not enter here into the history of the operation, but refer with pleasure to the learned and complete essay on this subject by my friend Dr. Townsend, which gives the accurate statement of our knowledge of the whole subject.*

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* See Dr. Townsend's Essay, Op. Cit.

I shall here merely remark, that I altogether agree with this excellent observer in his views as to the place of election in operating. He advises that the incision should be made higher up than is recommended,—in the fifth rather than the seventh intercostal space. The lower situation was chosen by surgeons in order to facilitate the escape of the matter; but this was, perhaps, an erroneous view, for there may be a favourable evacuation of the fluid from any part of the chest. In most of the cases of "empyema of necessity" which I have seen, the tumour formed in the third or fourth intercostal space, near the sternum, and the operation was successful. I have seen a case with my friend Dr. Houston, where the tumour formed immediately under the clavicle; the result was favourable. And in another instance, in the same gentleman's experience, the empyema opened above the clavicle: of this several instances are recorded. Nature thus seems to point out, that the opening should be high up; and when we reflect on the danger of wounding the diaphragm, as in the cases recorded by Laennec, La Motte, and Solingen, we must prefer the higher opening. In Laennec's case, although the incision was made between the fifth and sixth ribs, the diaphragm was transfixed. I have seen an instance of the same kind; the particulars are as follows.

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* See the Cyclopædia of Practical Medicine, art. Empyema; also the Essay of Dr. Hastings, before quoted; and a Note by the Editors of the Cyclopædia, with reference to the experience of Dr. Davies, which is favourable to the operation. Dr. Williams' and Dr. Davies' works must also be referred to.

In the case of empyema from gun-shot wound, which I have already mentioned, the patient, from intense pain of the side, which never intermitted, kept himself constantly bent on the affected side: in consequence, the side was contracted, although with acute empyema. The operation, however, was performed in the usual place, between the sixth and seventh ribs, but no fluid escaped. On the finger being introduced, the sensation of a bag of liquid was conveyed; and it was obvious that the knife had penetrated below the diaphragm. A trocar was now thrust upwards, which perforated the diaphragm, when a little sero-purulent fluid escaped, without any relief: the patient soon afterwards sunk. It was found, on dissection, that the kidney had been wounded deeply in its upper portion; upwards of a pound of blood was effused into the surrounding cellular tissue; and the perforation of the diaphragm by the trocar was easily demonstrated. The orifice seemed to have been closed by the coagulable lymph.

The mode of operation, by the repeated removal of small quantities of fluid, as recommended by Morand, should in all cases be preferred; but particularly in the chronic effusions, where the lung has been long compressed, and probably atrophied. Time must be given for its gradual development, for the restoration of its circulation and permeability, and for the return of innervation to the intercostals and diaphragm. The necessity for this mode of operation will be of course greater where the fluid is purulent than in the serous effusions. Indeed, in chronic cases, I would recommend, that not more than a few ounces of fluid should be withdrawn at each operation.*

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* See Morand, Memoires de L'Academie de Chirurgie; also Boyer, Traité des Maladies Chirurgicales, who gives a case remarkably illustrative of the danger of complete evacuation.

PASSIVE OR MECHANICAL EFFUSIONS.

The advance of medicine has shewn, that so far from idiopathic hydrothorax being a common affection, it is in reality one of the rarest of pulmonary diseases. I have never seen any case of it. Almost every instance in which it was supposed to exist has turned out to be bronchitis, pneumonia, congestion, œdema of the lung, Laennec's emphysema, or morbus cordis. We owe much to Laennec for his discovery of this most important fact.

But the mechanical effusions are much more common, yet even these are rarer than might be supposed; and we shall observe effusions into every cavity of the body, except the pleura. And it must not be forgotten, that there are no symptoms peculiar to this disease: even in the dropsical diathesis, the symptoms, as given in nosological works, depend much more on other diseases.

In most respects, the physical signs agree with those of empyema. But there is one remarkable exception; I have never observed dilatation of the intercostal spaces, or protrusion of the diaphragm. And this fact, among others, I have adduced as an argument in favour of my views of the cause of muscular displacement in empyema.

In general, where the serous effusion is not too copious, we observe the change of sound varying with the position of the patient. In one instance, however, I have seen an exception to this; it was the case of a multilocular hydrothorax, the septa being formed by previous and old adhesions.

Lastly, mechanical hydrothorax may be confined to one pleura. I have more than once verified this fact; so that the *a priori* conclusions of Dr. Darwall on this subject cannot be admitted.*

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* Dr. Darwall gives the dulness and absence of respiration, at one side only, as a distinguishing mark between empyema and hydrothorax. See Cyclopædia of Practical Medicine, art. Hydrothorax.

I have long believed that the diagnosis between empyema and hydrothorax, as given by Hippocrates, was more correct than Laennec admitted. The following is Laennec's translation of this celebrated passage.—"You shall know by this that the chest contains water, and not pus, if, on applying the ear during a certain time on the side, you perceive a noise like that of boiling vinegar." "I need hardly state," Laennec remarks, "that the assertion, as far as the diagnosis is concerned, is erroneous. The sound heard by Hippocrates was probably that of simple respiration; or this intermixed with a crepitating rhonchus."*

Yet, when we consider the condition of the lung in the two diseases of empyema and hydrothorax, the diagnosis of Hippocrates seems much more accurate than Laennec has admitted. In the first disease, the lung is but rarely engaged; no rale is heard; no "*sound of boiling vinegar*," while hydrothorax rarely occurs without more or less of œdema, or congestion of the lung. So that, the existence of liquid within the chest being admitted, the occurrence of rale would indicate hydrothorax rather than empyema.

TREATMENT OF HYDROTHORAX.—When the signs of effusion occur without fever or pain, we may often remove them by the diuretic treatment. In this disease, digitalis seems to have a peculiarly good effect, and the best preparation is the infusion. Dr. Forbes remarks, that the remedy is most effective in the asthenic diathesis, with debility, pallor, and feeble pulse. In such cases, he combines opium with the remedy, and finds it to increase the diuretic action. He also adopts the practice of Maclean, who combined it with carbonate of potass and nitrous ether. My learned friend Dr. Macdonnell, of Cavan, combines the infusion of bark with that of digitalis, and speaks highly of the remedy. The lancet may be employed in the early attacks, if the constitution admit; and we always derive advantage from purgatives, and tonics. Dr. Forbes proposes the preparations of iron; mercurials and squill also act well, as also the acetate of potass. I have never given iodine in this disease.

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* Forbes' Translation.

But even though no inflammatory symptom may attend the affection, we obtain great benefit from local depletion and counter-irritation. I have even known dry cupping to have the best effect.

In several recorded cases, paracentesis has been performed, but, as might be expected, without satisfactory results, although in a few instances temporary relief has been given.* In the last stages of this affection, as well as in empyema, the suffering is often extreme. Opiates have been proposed to alleviate the dyspnœa; but I know nothing that gives such extraordinary relief as keeping up an action on the bowels, and preventing the accumulation of flatus: and thus a turpentine enema will often give immediate relief from a state of indescribable suffering.

ULCERATION OF THE PLEURA.

We may divide the perforations of the pleura into two classes.

1st. Those in which the ulcerative disease has first engaged other parts, and the serous membrane is perforated from its posterior surface.

2nd. Those in which the ulceration results from original disease of the pleura, and begins at its interior surface.

Of these cases the first are by far the most frequent. In this category we may enumerate the perforations from tubercle, gangrene, and abscess of the lung, the ulcerations from hepatic abscess, and from anthrax or other disease of the thoracic parietes, while in the second we have those cases in which purulent collections having formed from pleuritis, are discharged by an opening through the costal, pulmonary, or diaphragmatic pleura.

In the section on Perforating Abscess of the Lung, I have given some examples illustrative of the first variety. I shall now examine the subject of fistulous openings in the pulmonary pleura.

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* See the statement of the cases operated on under the direction of Dr. Davies. Forbes's Laennec, p. 454.

As tuberculous ulceration is the most common cause of this lesion, we shall first speak of empyema and pneumo-thorax occurring in phthisis, next of that resulting from gangrene of the lung, and lastly, compare these cases with those where there is first simple empyema, which is ultimately complicated with pneumothorax from the consecutive perforation of the pleura.

EMPYEMA AND PNEUMOTHORAX OCCURRING IN TUBERCULOUS PHTHISIS.—Since the discovery of the stethoscope, a great number of cases of this quadruple lesion have been observed; and the researches of Reynaud, Louis, Beau, Forbes, and Houghton, have added much to our knowledge of its pathology and diagnosis.

The disease may set in with violent symptoms, or be so latent that we cannot determine the date of its invasion. In the first case, there may be rapid suffocation; but in many instances, a period of comparative, and often singular tranquillity succeeds the first violent symptoms.

Like other internal solutions of continuity, this lesion is generally pointed out by sudden, new, and extraordinary symptoms. These proceed from the new inflammation of the pleura, on the one hand, and the collapse of the lung, on the other. But as pleuritis, even under these circumstances, may be latent, and as the collapse of the lung varies much in different cases, we can understand how, in a case without pain, and with at first but little collapse of the lung, the suffering should be but trifling.

In some cases, the collapse of the lung is sudden, and nearly complete; while in others this is prevented by adhesions or solidity: the lung yields gradually to pressure, and even in chronic cases may never become completely impermeable. This is the most common case.

The symptoms commonly observed are the following:—A sudden, new, and violent pain, with a sensation as if something had given way, is felt in the lower portions of the side; followed by dreadful dyspnœa, suppression of expectoration, extreme anxiety, and general collapse. In addition to these, there may be loss of voice, and impossibility of lying on one side. In the more violent cases, death may occur, with aggravated suffering on the day of the accident; but this is rare, for a diminution of symptoms is commonly observed, and the system accommodates itself to the new condition of the lung. The side becomes dilated; the mediastinum is displaced; and the peculiar physical signs of the disease are manifested.

As a diagnostic of perforation of the lung, the occurrence of sudden and overwhelming dyspnœa, accompanied with pain, has been strongly dwelt on by Louis; but in phthisis these symptoms often occur without any such lesion. Thus, I have frequently suspected a pneumothorax, and yet found the physical signs wanting; so that we must never trust to the symptoms, unless they can be verified by physical signs. The pain may occur with every degree of intensity, and is generally aggravated by lying on the affected side. It is independent of the previous sensation of something giving way. Thus, in a patient of mine, the first sensation was that of a sudden crack, extending from above downwards, and accompanied by a feeling, as if liquid was shed out into the chest: acute pain in the side afterwards set in. Similar phenomena have been observed by others. In a case recorded by Louis, the patient, at the moment of perforation, and shortly preceding the pains, felt as if air was circulating in the chest from below upwards, clearly attributable to the passage of air into the left pleura.* In the sixteenth epistle of Morgagni, a case is noticed, on the authority of Willis and Lower, which presented analogous phenomena, both as to the first sensation of something giving way, and the dropping, "*stillicidium*" into the chest, perceptible not only to the patient, but also audible by the by-standers.

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* See Louis on Phthisis, Dr. Cowan's Translation.

Notwithstanding the pain, it often happens that the patients lie on the affected side. Dr. Houghton remarks, "that the violence of the pleuritic pain forces the patients to turn to the sound side, in spite of the increased oppression which the change induces. We have witnessed a case in which the struggle between the pain, augmented by lying on the affected side, and dyspnœa, aggravated by changing to the opposite, was extremely distressing; but here the want of breathing triumphed over the pain, and compelled the poor patient to endure the latter as the lesser evil. When the intensity of the pain has passed, if a change has taken place during its continuance, decubitus on the affected side is usually resumed."

In several instances I have observed a complete change in the character of the cough, and a cessation of expectoration. The latter symptom seems peculiar to those cases in which the expectoration had been furnished by the lung which was subsequently perforated. I have seen a case in which the expectoration, being previously copious, ceased on the occurrence of fistula, and only returned when tubercular ulceration had invaded the opposite lung. A gentleman, labouring under this disease, assured me that he was often unable to expectorate, in consequence of the fluid, on reaching the trachea, falling, as he expressed it, down into the opposite side.

But one of the most singular circumstances connected with this subject, occurred in the case of an elderly man, who lived for many months after the occurrence of the fistula. For a length of time his principal—indeed only suffering, was from dyspnœa, occasioned by the increase of the liquid effusion. Whenever the symptom became too urgent, he relieved himself by the extraordinary manœuvre of placing his head on the ground, and then elevating his heels against a wall, until the reversed position was nearly vertical, when a vast quantity of sero-purulent fluid was expectorated, and relief given for a considerable period of time.

Sudden loss of voice has been observed by myself and Louis. In my case, voice returned in eighteen hours; in that by Louis the aphonia was remittent. I have also noticed this symptom in pleuritis of the left lung, and in a case of dry pericarditis. In all these cases there was merely aphonia, without stridor or laryngeal cough; and the symptom subsided with the decrease of the disease.* Notwithstanding the suddenness of the pleuritic inflammation, we seldom observe high fever to follow the perforation. On this subject my experience differs from that of Dr. Houghton's. More commonly we find a state approaching rather to collapse, with pallor, feeble pulse, and sometimes even a tendency to syncope. In fact, in this respect, there is a great similarity in the constitutional state and that in perforation of the intestine, with this difference, that the sinking of the powers of life is much more rapid in the peritoneal than the pleural perforation. But the perforation and subsequent lesions may be singularly latent, and then, as before stated, it is often impossible to determine the period of ulceration. Thus, in Dr. Townsend's case, the invasion of the disease was marked by no sudden aggravation;† and the same was observed in the remarkable case published by Dr. Houghton.‡ I have known several instances where the first symptoms were not more violent than what we often see in phthisis from a new attack of irritation, and in which the physical signs alone revealed the accident.

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* This curious symptom, proceeding, in all probability, from action on the recurrent nerve, is noticed by Testa, who gives three cases of fatal pericarditis simulating angina, in which dysphagia, pain of the throat, difficult and stridulous respiration, and alteration of voice, were observed—*Delle Malattie del Cuore*, vol. iii. capo. v. *Dei Pericarditici et Carditici Anginosi.*

† Transactions of the Association of the King and Queen's College of Physicians in Ireland, vol. v.

‡ Dublin Journal of Medical Science, vol. v.

In many cases, where the disease becomes chronic, we may observe a singular suspension of the usual symptoms of phthisis. The phthisical countenance disappears; the sweats cease; the pulse I have known in some cases to become quiet, and the patient may gain flesh and strength to a surprising degree, and be only troubled with dyspnœa on exercise, and with the sound of fluctuation in the chest. In the case by Dr. Houghton the patient, a bricklayer, made several extraordinary rallies, during each of which he returned to his occupation. This patient lived upwards of a year. I have known a gentleman in whom a phthisical cavity opened into the right lung with the same singular phenomena. After recovering from the first violence of the disease he gradually regained his flesh, strength, and appearance; his hectic totally subsided, his pulse became quiet, and he took horse exercise every day. He assured me that he could trot or canter his horse, only for the "*splashing*" in his chest which then annoyed him. All this occurred with a dilated side, a depressed liver, and the physical signs of pneumo-thorax and empyema to a great amount; and in this condition the patient lived for many months.

I have long thought that the suspension of hectic under these circumstances, was to be explained on the same principle that we account for it after the removal of an external disease, such as white swelling. I have before stated my conviction that the hectic of phthisis is more a measure of the irritation than the suppuration of the lung; and when we reflect on the collapse of, and pressure on, the affected lung; the obliteration of its blood-vessels, and the atrophy thereby induced, we must admit that it is placed in a condition unfavourable to the progress of irritation or of tubercle. Nearly similar views have been adopted by Dr. Houghton.

Physical Signs of Perforation of the Pleura.—This accident being almost always accompanied by pleuritic effusions, the physical signs are those of liquid, as well as air existing in the pleura. They may be enumerated as follows:

1st. Dulness of sound, and absence of respiration inferiorly, and extending upwards as far as the liquid effusion.

2nd. Morbid clearness of the upper portion, with or without complete subsidence of respiratory murmur, or *the former signs of disease.*

3rd. The sound of fluctuation on percussion.

4th. The metallic tinkling.

5th. The metallic respiration, voice and cough.

6th. Dilatation of the side, and other signs of eccentric displacement.

In the first periods we may find little or no dulness, and the signs are the absence of respiration inferiorly, with some of the metallic phenomena. This I have verified in several cases. As the effusion increases, however, the dulness appears terminating, as in simple empyema, by a well defined line, above which there is a morbid clearness. It is at this line that Piorry has remarked the "*son humorique.*" As might be expected, the sound on percussion varies remarkably with the position of the patient, who is often conscious of the change in the situation of the liquid effusion.

The morbid clearness, above the effusion, corresponding to the pneumo-thorax, is by no means the same in all cases. Indeed in some it is scarcely if at all perceptible, particularly when there is no tension of the thoracic parietes, as occurs when the fistula is permanently patent. In other cases however, it is a prominent sign, and continues to the end, unless where the liquid effusion increases to a great degree; when, although the metallic signs continue, all tympanitic sound on percussion may subside.

In many cases a feeble murmur continues in the upper portions of the side, and I have more than once verified the continuance of the signs of the original cavity.

The sound of fluctuation may be classed along with the other metallic phenomena. After the fluid passes a certain point it ceases to be heard. It may be produced in some persons by almost every, even the slightest, agitation of the body, such as that from coughing, sneezing, turning, walking up stairs, rising up, or sitting down; while in others, apparently in the same physical condition, it is often absent for a length of time, or is produced only by violent or peculiar succussions. In such cases, during the exploration, the patient should sit on a hard seat.

On the subject of the metallic tinkling, and the characters of the voice, cough, and respiration, I have little to add to the statements of preceding authors. These phenomena, once heard, can scarcely ever be mistaken; the only case in which an erroneous diagnosis could be come to, is that of a vast pulmonary cavern; but this error cannot be made by any one who studies the accompanying signs, and the history of the case. I have already given the differential diagnosis between these affections.

The signs of excentric displacement in this disease have, in some cases, a double origin, proceeding from the pressure of liquid, as well as the tension of air. In others, however, where the fistula is not valvular, they proceed solely from the pressure of the liquid. In one case, we observed, after the disease continuing upwards of a year, that the affected side was contracted, or, at least, was less than the opposite, and the heart was in the mesian line. This circumstance, among others connected with the particular case, led Dr. Houghton to the opinion of the possibility of a cure in the disease, even when proceeding from a phthisical ulceration.

I shall now detail some cases of perforation of the pleura in its different varieties.

Case I.—*Chronic Phthisis. Sudden Perforation, with consequent Empyema and Pneumo-thorax continuing for five months.*

A female, aged 25, after labouring under phthisis for several months, felt, during a fit of coughing, a sensation as of a sudden crack, extending from above downwards, followed by the feeling of something having been shed out into the cavity of the chest. The usual symptoms of empyema and pneumo-thorax set in, and at the end of a fortnight the heart pulsated to the right of the sternum. She remained in a low, semi-hectic condition for five months, during which the sound of fluctuation and the various metallic phenomena existed with but little variation.

Dissection.—The left pleura contained upwards of a quart of an opaque fluid, not by any means putrescent. The fistula existed in the upper lobe communicating with a tuberculous cavity of the size of a pullet's egg. The opposite lung was also tubercular.

Two interesting subjects present themselves for consideration in this case: one, its duration, and the other (not peculiar indeed) the absence of putrefaction of the effused fluid. The patient lived five months and thirteen days from the occurrence of the fistula. I shall just now detail other instances of a still greater duration.

The absence of putrefaction in the effused fluid is, indeed, difficult of explanation, when we reflect that every circumstance of heat, moisture, and air concur to favour such a result. I believe it to be one of the many facts which show that organic connexion is not absolutely necessary for the transmission of vitality. This absence of putrefaction is commonly observed, and would seem to prove, that when decomposition does occur, it is owing to some other conditions than the entrance of air. Of this the following is a good example.

Case II.—*Phthisis, with Consecutive Fistula, Empyema, and Pneumo-thorax. Operation for Empyema, subsequent Gangrene of the Pleura.*

A gentleman under my care for phthisis, was attacked suddenly with overwhelming dyspnœa, and dreadful anxiety. I saw him shortly after, and found absence of respiration over the lower portion of the left side, without alteration of sound on percussion, or metallic signs: next day, however, these were evident. The liquid effusion increased, and in about a month, his sufferings from dyspnœa were so severe, as to warrant the operation. In consultation with Mr. Porter, I found that the effusion was already pointing externally, between the fourth and fifth ribs. The tumour was opened, and a large quantity of fluid, without any fœtor, given exit to. He remained, to a certain degree, relieved for several weeks, when his distress returned, and the fluid in the pleura again pointed at the original situation. A second opening was made, and a fœtid sanious fluid evacuated: soon after this the patient sunk.

On dissection, we found an almost universal gangrene of the pleura; there was but little fluid in the cavity, but the serous membrane was sphacelated in many situations, and several of the ribs completely denuded, not only of pleura, but periosteum. The whole cavity exhaled a horrible fœtor; both lungs were full of tubercles: the fistula was easily perceptible.

This case, with others, leads me to believe, that the mere entrance of air is not the cause of putrefaction in the fluid after operation, even in simple empyema.

Case III.—*Acute Phthisis, with Pneumo-thorax.*

A man, æt. 25, three weeks before admission was attacked with severe pain in the chest, cough, and expectoration. On admission, he had a continual harassing cough, copious muco-purulent expectoration, great dyspnœa, disturbed sleep, with night sweats; he was much emaciated; pulse 112; respiration

44; the chest sounded well on percussion; bronchitic rales were heard throughout both lungs, but chiefly in the right, where the respiration was very feeble.

In this state he continued for ten days, when metallic tinkling was observed when the patient inspired, coughed, or spoke, extending over the greater part of the right side anteriorly; diminishing posteriorly, and entirely disappearing in the upright position; no cavernous respiration or gurgling; sputa thick, and scanty; cough not so severe.

The intercostal spaces of the right side soon became prominent, with dulness on percussion; decubitus on this side impossible; integuments œdematous; superficial veins much enlarged.

He died within three weeks from the period of perforation. The right side of the chest measured two inches more than the left; the pleural sac of the right side was distended, and covered with a layer of lymph towards the mediastinum; the membrane was in the normal condition; the sac contained a very great quantity of sero-purulent fluid, and air; the lung was exceedingly atrophied, and coated with lymph; it was adherent by a small strap to the second rib anteriorly, beneath which the fistulous opening was observed, leading obliquely upwards into the lung, and full of caseous matter; the left lung was tubercular, and adhered to the pleura; there were some slight interlobular adhesions; the pericardium contained a reddish-looking fluid; the heart was healthy.

The interest of this case consists in its shewing the occurrence of death from phthisical pneumo-thorax in so short a time from the first illness.

In the general history of pneumo-thorax, I have mentioned the interesting fact of the suspension of the usual phthisical symptoms, which in some cases followed the new disease, and instanced the example published by Dr. Houghton, in which, during a year, the patient was able frequently to return to a laborious occupation. Of the slight degree of constitutional suffering which may attend this complication, and of its long compatibility with life, the following is a good example.

CASE IV.—*Empyema and Pneumo-thorax with singular Preservation of general Health for upwards of a Year.*

A gentleman, aged 22, was attacked with symptoms of phthisis, soon followed by the signs of a small cavity in the upper lobe of the right lung. He removed to a temperate climate, and had a seton inserted; under which treatment he was improving, when perforation, accompanied with violent symptoms, supervened. Under active treatment his life was for the time saved, and he remained for some months in a quiescent condition, with all the usual signs of pneumo-thorax and empyema. He then came back to Dublin, complaining of nothing but an unfrequent yet hard cough, and dyspnœa on exercise. The right side was greatly dilated, and the liver depressed. As summer approached his appetite and appearance returned; his pulse was quiet; there was no hectic; he got flesh, and was able to take daily exercise on horseback; the peculiar phthisical countenance wholly disappeared. Thus he continued for many months, with all the physical signs of the disease. From the period of perforation to death more than thirteen months intervened. Hitherto we have studied the perforation of the pleura by phthisical ulceration, but Laennec, and subsequent authors, have shown that gangrenous action may have the same effect. I shall detail three cases of this variety of pneumo-thorax.

CASE V.—*Simple Empyema from Injury. Perforation of the Lung, and consequent Empyema and Pneumo-thorax.*

A man, ætat. 23, received a strain in his right side, followed by slight pain; his breathing became then affected, and the pain distressing. On admission, a fortnight after, he complained of severe pain in the right side, increased on making a full inspiration; some cough at night, with pituitous expectoration; skin hot and dry; pulse 110, full and strong; can lie only on his back. On percussion, the chest sounds dull on the right side posteriorly, from the scapula downwards, and in this situation there can be heard only a very feeble respiration: the left side appears healthy, as also the anterior part of the right. There is no rale audible in any part of the lungs.

On the next day, 23rd of December, pain is diminished; can lie on either side; some epistaxis; sputa thin; the entire posterior portion of the right lung is dull on percussion; respiration feeble, with well-marked egophony; pulse full and soft, 108; skin, cool and moist.

24th. Had some sleep; constant hard cough, without expectoration; refers the pain to the antero-inferior region of the chest; dulness continues posteriorly, but the egophony has disappeared. While he lies on the left side, respiration becomes audible in the antero-inferior and lateral regions of the right side, and disappears when he lies on the back; respirations 30, chiefly thoracic.

25th. Pain relieved by leeching; respiration can be heard now in the infra-mammary region, with frottement; the stethoscopic phenomena of the posterior portion the same as yesterday.

26th. Frottement has disappeared; posteriorly the egophony has returned.

27th. Passed a restless night, from coughing; this morning is feverish; pulse strong and full; dulness continues posteriorly, with some resonance of the voice. When the patient lies on his face, the respiration is more audible.

28th. Gums sore; some salivation; passed a restless night from cough, with mucous expectoration; pulse 96, strong, full, and soft; the right side is dilated nearly an inch; no change in the stethoscopic phenomena since yesterday.

March 1st. Respiration more hurried, with severe pain in the side; considerable tenderness and fulness in the region of the liver; pulse soft, full, and weaker than yesterday.

Four o'clock, P. M.—Since the visit this morning, he has been much worse; the countenance is sunk, and the body covered with a clammy sweat; great prostration; a copious expectoration of sero-purulent fluid, emitting a horrible fœtor; on succussion fluid is heard dashing about in the cavity of the pleura; there is great dyspnœa, and constant cough. An operation to evacuate the matter from the chest was proposed, but the patient would not accede to it.

2nd. The expectoration has in a great measure ceased; at the postero-inferior region of the right side the tintement metallique is heard; dyspnœa very great; general sinking. He died in the course of the day. His friends would not allow a post mortem examination.

The above case is an excellent example of the evacuation of a simple empyema by gangrenous eschar of the pleura. Active treatment was employed, but without effect. The system had been brought under the influence of mercury a short time before the perforation.

That individuals have recovered by expectoration of the fluid effused, does not admit of any doubt. I have myself seen a case of this kind, which was under the care of Mr. Crampton. But that the perforation is in all cases the result of gangrene, seems very doubtful. In the favourable cases it is probably by simple ulceration. I may here mention a curious pathological condition of the pleura, which I have frequently observed in chronic pleurisy. It is a cribriform state; the perforations being exceedingly numerous, but so small, as scarcely to be distinguished without the magnifying glass; and indeed the best mode of demonstrating them is to inflate the lungs under water, when numerous minute bubbles are seen to arise from the surface.

CASE V.—*Gangrene of the Lung, Empyema, and Pneumothorax; Paracentesis; Gangrenous Destruction of the Costal Pleura; Passage of the Fluid behind the Peritoneum.*

A gentleman, æt. 36, generally very healthy, with a large, well-formed chest, had occasionally complained, for the last few months, of pain in the chest, at one period very severe; he had been cupped and blistered, but without relief: at length hectic symptoms set in, with restless nights; soon after he felt as if something gave way in his side, and immediately expectorated a horribly fœtid matter. A similar attack occurred in a few days, with the same fœtid discharge, but accompanied by prostration, lividity of the countenance, and dyspnœa. I saw the patient along with Dr. Marsh and Mr. Crampton. We found the chest to contain air and fluid; and in consultation made the diagnosis of gangrene of the lung, and advised paracentesis. The operation was performed between the seventh and eighth ribs, a little below and external to the right mamma; the withdrawing of the trochar gave issue to a quantity of fœtid air; a probe was introduced, and met by an elastic resisting substance; this was apparently perforated, and about three quarts of dirty, grey-coloured, fœtid fluid given exit to. Great relief followed the operation. The patient, however, passed a wretched night, with hectic paroxysms; no discharge occurred from the wound.

17th. The trochar and canula were introduced, and a quart of the same fœtid matter came away—patient felt easier; passed a bad night.

18th. A pint of fœtid matter was taken away; spent a most uneasy night, with incessant cough and frothy expectoration, the act of coughing sending the fœtid air and matter through the external opening in great quantities.

19th. Much exhausted; said he felt as if there was a well in his chest; he was sensible of a constant dropping of fluid; pulse 120; great weakness; heat and soreness in the side.

20th. Mr. Colles saw him, in consultation with the other attendants. Anodyne enemata and stimulants were ordered; he passed a better night, but had great dysuria; ordered mucilaginous drinks.

21st. Passed a bad night; pulse 144, and weak; during a fit of coughing, which brought on the usual discharge from the wound, about a cupful of blood gushed out.

22nd. The introduction of a gum elastic tube gave exit to no fluid, but a great quantity escaped while the patient coughed; the abdomen became tense and tympanitic, with exacerbation of all the symptoms, and the patient died in about thirty-six hours.

Dissection.—Externally the body presented some livid marks at the right side, and a slight fulness in the right inguinal region and side of the scrotum. The right pleural sac contained above a quart of fœtid purulent fluid; the lung was of a dark greenish hue, smeared with a creamy substance; its lower and back part destroyed by gangrene, leaving a large greenish-coloured cavity, the size of the hand. The substance of the lung near this was easily broken down, and the vessels and bronchial tubes were seen passing through it; the remainder was gorged with a frothy dark sanies; the whole lung was reduced to half its size; some adhesions united it to the mediastinum, almost forming a circumscribed cavity: the costal pleura was in some places highly vascular; in others, covered with lymphy secretion; in some places very tenacious. In one patch, destroyed by gangrene, the intercostal muscles were laid bare for the space of several inches, and were in one part sloughy, forming an opening at the inferior and posterior part, at which place nature had attempted an outlet for the fluid, the latter having made its way into the cellular tissue, beneath the skin, and between the peritoneum and abdominal muscles, down the side of the abdomen to the scrotum. The general cavity of the right side was much diminished by the liver having been displaced upwards by the flatus of the intestines: the liver was in such close apposition with the lung, as to be in danger of being wounded by the trochar; thus accounting for the fluid not coming off by the canula in the first instance.

Case VII.—*Empyema of the Right Side; opening by Anthrax; Pneumo-thorax by external Fistula.*

A labourer, eighteen months ago, became affected with cough and hæmoptysis. Seven months past, he received a severe contusion of the right side, followed by severe pain and cough; continued ill for six weeks, with dyspnœa, aggravated by exercise. The dyspnœa continues, and obliges him to lie constantly on the right side. Four months ago he perceived a tumour on the upper part of the abdomen; and, within the last month, œdema of the lower extremities has supervened.

October 11th. There is perfect dulness of the whole right side, from the clavicle to the short ribs, extending to the left side of the sternum, for its whole length. In the right infra-clavicular region a feeble tracheal respiration, with some slight sonorous or sibilous rales, is audible. The same can be heard in the supra-clavicular region. Over the rest of the side there is nullity of respiration. No gargouillement, muco-crepitus, nor bronchial respiration whatever. The voice sounds strongly in the supra and infra-clavicular regions. The whole side is dilated somewhat more than an inch; the intercostal spaces are raised, giving complete smoothness to the side; over the left lung respiration is completely puerile. The whole of the upper portion of the abdomen is occupied by a large and prominent tumour, whose greatest eminence appears along the mesian line, and extends into the left hypochondrium.

20th. He complains of pain in the lower portion of the right side, just below the short rib. There is some tenderness, tumefaction, and a slight blush.

November 1st. The superficial veins of the right side are enlarged; the heart is displaced upwards, and about three inches to the left side.

Thus he continued for a month, when the tumour was found to have increased in size, to be quite soft, and surrounded by a dark, livid redness. A lancet was plunged into it, giving exit to a small quantity of bloody sanies. Patient complained of great pain.

3rd. A serous fluid is constantly draining in great quantity from the sore. The patient's lower extremities and abdomen, which were anasarcous, are becoming rapidly devoid of fluid.

6th. Anasarca nearly gone. On attempting to make a more free opening in the tumour, the patient lost about twelve ounces of blood from the vessels of the integuments: but the pain in the tumour was greatly relieved.

7th. The discharge is increased, and is sero-purulent; the right side is dull, anteriorly and posteriorly, as high as the mamma; from that up it is natural; and over this space respiration is distinctly audible, loud, and with something of a tracheal character, immediately below the clavicle; feeble, as we approached the limits of the clear sound; below this, nullity of respiration. The heart now pulsates in its natural situation. In the abdomen the tumour, formerly evident is now not so perceptible to the eye; but is easily distinguished by the hand, and its boundaries distinctly defined by percussion. The liver, especially the left lobe, appears enlarged. There is considerable heat of skin, and a tendency to rigors. The patient sweated copiously last night.

10th. Patient complains more of dyspnœa; anteriorly, and in the axilla, on a level with the sixth rib, the sound of the chest is morbidly clear; below this, perfect dulness; nullity of respiration complete, except over the root of the lung, and in a small space to the right of it; here it has a bronchial character. The cough and voice are distinctly metallic.

13th. The sloughs have come away, and the sore looks healthy. Patient complains greatly of dyspnœa, and a "*feeling of wind passing in and out of the hole*," and air can be heard gurgling along with the sero-purulent discharge; but the flame of a wax taper applied to the aperture is not sensibly affected. He constantly presses his hand strongly above the aperture, and says this relieves his breathing very much. Had a slight rigor to-day, with tendency to syncope, and afterwards sweated. The sero-purulent discharge continues; and when he sits up, or goes to stool, it comes away in gushes.

14th. Discharge has become very fœtid; the fistulous opening appears near an inch wide at its commencement; a probe may be introduced its whole length, with facility. Compresses of dry lint were lightly strapped down along the course of the fistula. The sore was dressed with nitrate of silver and dry lint; and, over all, a broad roller was applied to the chest, with considerable tightness, from which the patient expressed great relief.

15th. Slept pretty well, without sweat. The discharge had diminished; but, on the patient sitting up, and having the sore dressed, fully a pint of very fœtid sero-purulent matter was evacuated, during the flow of which he complained of agonizing pain, compared by him to burning by hot iron, and causing him to scream aloud. The discharge was followed by about an ounce of bloody sanies.

25th. At this time I found that respiration was audible only along the spine and sternum, and confined to a very narrow space; the sound of air making its way through the fistulous opening, and simulating respiration, was generally audible over the whole of the right side; with the metallic character as before. The patient expired on the 29th December.

Dissection.—Body generally very much emaciated; œdema of the lower extremities. The external sore and fistulous opening were situated exactly above the last false rib, near the spinal column; through these a bougie was introduced with great facility, passing upwards, and to the left side, appearing to enter the right pleural cavity. In raising the sternum, it was necessary to divide a considerable extent of old adhesions, which connected the antero-inferior third of the right lung to the parietes. On laying open the thorax completely, the left lung appeared perfectly healthy; the right lung lay along the spine, greatly reduced in volume, but of its natural length, and connected to the diaphragm by a very firm adhesion, about three inches in breadth. The pleura was lined with pus, of which the cavity contained four ounces, mixed inferiorly with large membranous shreds of lymph, among which the point of the bougie was seen protruding, having entered by an opening large enough to admit the tip of the little finger, situated in the most depending portion of the cavity, about an inch from the spine in the angle formed between the diaphragm and the parietes. No other breach of continuity could be discovered in the pleura. The substance of the right lung was carnified, and generally studded with tubercles in different stages. The left lung was also tubercular in its superior lobe. The liver was of a dirty yellowish colour, nodulated, and greatly enlarged; the right lobe extending down to the umbilicus, and the left far into the left hypochondrium.

This last case is interesting, as exemplifying the occurrence of metallic signs in pneumo-thorax from external fistula, and without the existence of fluid. The signs continued after every drop of fluid had drained through the opening in the side. The fact that the presence of liquid is unnecessary for the existence of metallic signs, has heen already established by Dr. Williams. With the exception of the signs of dropping or bubbling, all that is wanting to cause metallic sounds, is a cavity of sufficient size, containing air.

Before discussing the treatment of pneumo-thorax with fistula, I may remark, that in the early periods of the disease the lung may not be completely fixed. Thus, we may observe in cases, in which, during the erect position the signs are evident, posteriorly and superiorly, that they disappear when the patient turns on his face, and are replaced by vesicular murmur, although they continue in the anterior and inferior portions. This can only be explained by supposing, that as the liquid accumulates along the mediastinum, it forces the lung against the posterior portion of the costal pleura.

The question of the curability of pneumo-thorax and empyema from fistula has been mooted by Dr. Houghton; and, doubtless, in his case there was an attempt towards cure. The records of surgery shew that the mere existence of fistula is not always hopeless; but we must draw a careful distinction between cases of wounds of the thorax, where the lung was previously healthy, and those where the fistula has proceeded from idiopathic lesion. We know further, that the opening of a simple empyema into the lung has been followed by recovery; and in such a case the chances are better. But where the disease has proceeded from the opening of a gangrenous or tuberculous abscess into the pleura, the chances of recovery, even without reference to the condition of the pleura, must be infinitely small; and, I believe, there is no recorded instance of such an event.

Finally, little is to be hoped from an operation in this disease; and it should never be undertaken unless when the distress is distinctly traceable to the enormous accumulation of liquid, as shewn by extensive dulness and diminution of the metallic signs; and even in such a case the relief is much less than might be expected; and there is the greatest liability to gangrene of the pleura. This I have repeatedly verified; and the rapidity of the destruction of the serous membrane is truly singular. I have given a case, in which, previous to the operation, no symptom of gangrene existed, where the fluid withdrawn had no fœtor whatever, yet where the whole pleura was destroyed in a few days; the ribs were actually denuded, and seemed in a state of necrosis.

RECAPITULATION OF THE PHYSICAL SIGNS OF DISEASES OF THE PLEURA.

1st. That the dulness of a pleuritic effusion is generally more rapid than that of pneumonia, and is unpreceded by the crepitating rale.

2nd. That as diagnostics between pleurisy and pneumonia, these characters are not always applicable.

3rd. That as a sign of incipient effusion, dulness is more valuable when occurring at the left than the right side.

4th. That the dulness may be universal.

5th. That in certain cases, the fluid changes its situation with the position of the patient.

6th. That when partial, it terminates by a well-defined line.

7th. That the respiratory murmur may be totally extinguished, feebly audible, or distinctly bronchial.

8th. That the bronchial respiration is to be distinguished from that of pneumonia by the concurrent phenomena.

9th. That the egophonic sounds are extremely various and inconstant.

10th. That the absence of the vibration of the voice, as perceived by the hand, is an important sign.

11th. That when the voice is acute and feeble, this test is inapplicable.

12th. That the signs of excentric displacement are the most valuable of the physical indications.

13th. That dilatation of the side may exist without obliteration of the intercostal spaces.

14th. That as a sign of effusion, dilatation is more valuable when occurring at the left than the right side.

15th. That displacement of the heart occurs before that of the intercostals or diaphragm.

16th. That this dislocation is not necessarily accompanied by disturbance of the heart's action.

17th. That the same laws influence the displacement of the intercostals and diaphragm.

18th. That with a copious effusion, and mediastinal displacement, these muscles may be unaffected.

19th. That the mediastinal displacement can be ascertained by percussion, as well as by the position of the heart.

20th. That absorption is pointed out by the return of clearness of sound of respiration; and of the heart and liver to their natural situations.

21st. That the return of the heart does not imply the complete removal of the effusion.

22nd. That the rapid absorption of an empyema of the right side may cause a displacement of the heart to the right side.

23rd. That after absorption, the mediastinum may be so relaxed, as to allow of the heart changing its position under the influence of gravitation.

24th. That contraction of the chest is not a necessary consequence of the absorption of an empyema.

25th. That it may coincide with an early and increasing effusion.

26th. That by attending to the concurrent phenomena, we can generally distinguish pleuritic effusions from tubercle of the lung, pneumonia, or enlarged liver.

27th. That with the exception of intercostal displacement, the signs of hydrothorax are similar to those of empyema.

28th. That in hydrothorax, the fluid may not change its situation with the position of the patient, and is often confined to one pleura.

29th. That in the early periods of perforation of the pleura, absence of respiration may precede the metallic signs.

30th. That the metallic phenomena may be observed in the dropping of liquid; in the breaking of bubbles on the surface, and in the voice, respiration, cough, rale, and action of the heart.

31st. That these signs are modified by position.

32nd. That they may exist without the sound of fluctuation on succussion, at two periods of the case, namely, when the fluid is in extremely small, or in great quantity.

33rd. That for the production of the metallic voice, cough, and rale, it is not necessary that liquid should exist in the cavity.

34th. That in this disease, all the signs of excentric displacement may occur, but that these phenomena are best marked when the orifice is valvular.

35th. That the triple lesion may exist with a contracted side, and evident intercostal spaces.

36th. That morbid clearness is not always co-existent with the effusion of air.

37th. That the perforated lung is seldom wholly obliterated.

38th. That the signs of the original cavity may continue long after the perforation of the pleura and other lesions have occurred.

39th. That in certain cases the lung seems to change its situation with the position of the patient.

40th. That in simple empyema the occurrence of the sound on fluctuation almost certainly points out that the pleura has given way.

41st. That in pneumo-thorax by external fistula, the cough, voice, and respiration may be metallic.

42nd. That in this disease the sound of air passing through the external fistula may simulate the vesicular expansion.

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